AD-A266 725

5

1

COMMUNICATION OFFICERS SCHOOL

DTIC
S ELECTE D
JUL 0 8 1993
A

MARINE CORPS UNIVERSITY
MARINE CORPS COMBAT
DEVELOPMENT COMMAND
QUANTICO, VIRGINIA

This document has been approved for public release and sale; its distribution is unlimited.

RESEARCH PAPERS FROM

THE COMMAND AND CONTROL
SYSTEMS COURSE
1993

93-15237

UNITED STATES MARINE CORPS
MARINE CORPS COMBAT DEVELOPMENT COMMAND
QUANTICO, VIRGINIA 22134-5001

IN REPLY REFER TO:

8 April 1993

As a corps of officers, to us falls the responsibility of leading our Corps into the next century. Our responsibility is to encourage new thoughts and ideas. Innovative concepts and techniques have kept the Marine Corps at the forefront of the world's elite fighting organizations. One of the guiding principles of the Command and Control Systems Course is to encourage the development of new ideas and to experiment with previously untested concepts.

Over the past year, the students, with the assistance of their instructors, have focused on the command and control challenges facing today's Marine Corps. Topics of controversy were solicited from the Fleet Marine Force and while they cover a wide area of subjects, each represents a current or near-current problem that impacts on command and control within our Corps. The students researched the topics to provide insight into solving the identified problem or identifying steps that could lessen the severity of the problem's impact on the day to day operations of the fleet organizations. The enclosed papers are the results of their endeavors.

To all who have diligently contributed to this volume, especially the Marine Corps Command and Staff College Foundation, please accept my sincere appreciation.

R. M. Shea

R. M. SHEA
Colonel, U.S. Marine Corps
Director, Communication Officers School

Accesion For		
NTIS	CRA&I	☑
DTIC	TAB	☐
Unannounced		☐
Justification		
By		
Distribution /		
Availability Codes		
Dist	Avail and / or Special	
A-1		

THE MARINE CORPS

COMMAND AND STAFF COLLEGE FOUNDATION

The Marine Corps Command and Staff College Foundation was incorporated in the Commonwealth of Virginia, June 25, 1980, as a private organization to be operated exclusively for educational purposes. Its primary goal is to enhance the advanced professional education of Marine Corps officers and other personnel assigned to the Marine Corps Combat Development Command at Quantico, Virginia.

Since its inception, the Foundation has supported a wide range of programs for which government funding was not available. In essence, the Foundation's efforts and resources help maintain the margin of excellence which characterizes the Corps and its leaders. The Foundation provides support for:

The annual Major General John H. Russell Leadership Conference on leadership issues of interest to the Marine Corps.

The General Graves B. Eskine Distinguished Lecture Series to broaden the perspective of Marine Corps officers in the social, political and cultural dimensions of the nation and the world.

The General Gerald C. Thomas Endowment Fund for Amphibious Warfare Research by students, faculty and other selected Marines.

The Distinguished Chair of Contemporary Military Affairs to provide the faculty with an individual of national or international repute to lecture, chair seminars and participate in faculty enrichment programs.

The Training and Education Center's Operational Logistics Symposium to discuss current issues concerning deployment, employment and sustainment of Marine Expeditionary Forces.

The Communication Officers School Combat Leadership Symposium to introduce the student to senior officers who have excelled in combat.

The Command and Staff College Media Symposium to promote understanding of military-media relationship and responsibilities.

The Amphibious Warfare School Symposium to discuss contemporary amphibious warfare issues, concepts, and capabilities.

The Communication Officers School Symposium to promote research on Command and Control issues impacting the Fleet Marine Force.

The Basic School Reflections Series to provide a forum to the Corps' past leaders to share their ideas and personal philosophies with its future leaders.

The Major General Edwin B. Wheeler Award for infantry excellence at The Basic School.

The International Officers Alumni Newsletter for graduates of Marine Corps Schools from foreign countries.

Financial Support for this symposium was provided by Marine Corps Command and Staff College Foundation.

TABLE OF CONTENTS

THOUGHTS ON THE
FORCE FIRES COORDINATION CENTER

Submitted to
Major Febuary
and Ms. Lloyd-Stanger
at the Communication Officers School
Quantico, Virginia

Captain Christopher A. Hawes, USAF
Captain Kenneth S. Helfrich, USMC
Captain Robert S. Lee, USA
Captain Daniel J. Wawrzyniak, USMC

April 8, 1993

THOUGHTS ON THE FORCE FIRE COORDINATION CENTER

OUTLINE

The Force Fires Coordination Center is the agency through which the MEF commander can access all systems required to shape the battlefield.

I. Introduction

  A. Is the MAGTF commander a warfighter or allocator?

  B. The warfighter fights the deep battle.

  C. The FFCC is the MEF commander's warfighting arm.

II. The FFCC from a Historical Perspective

  A. What is the role of combined arms in warfighting?

  B. Operation Desert Storm sparks requirement for an FFCC.

    1. Birth of the FFCC.

    2. Why an FFCC in Desert Storm?

III. FFCC vs. FSCC: A Comparison

IV. MAGTF Fire Support Organization

  A. The Command Element

  B. The Ground Combat Element

  C. The Aviation Combat Element

  D. The Combat Service Support Element

V. Organization of the FFCC

  A. Structure of the FFCC.

  B. Section responsibilities and functions of the FFCC.

VI. Issue for the Future

INTRODUCTION

Is the MAGTF Commander a Warfighter or Allocator?

Periodically the question arises concerning whether a Marine Expeditionary Force (MEF) commander is a warfighter or an allocator. Does he take an active role in deciding when, where and how the battle is fought, or does he just divide assets among his subordinates? Guidance promulgated by the Commandant of the Marine Corps (CMC) throughout the years has attempted to resolve the issue but has been sufficiently vague to leave the decision to the MEF commander. Consequently, the MEF commander chooses his own destiny: warfighter or allocator.

The Warfighter Fights the Deep Battle.

As a warfighter, the MEF commander fights the deep battle. The deep battle is defined as the area forward of the Fire Support Coordination Line (FSCL) to the limit of the MEF's zone (Figure 1). In fighting the deep battle, the MEF commander visualizes the conditions under which future operations will take place, and then shapes the battlefield to match these conditions.

Prior to and during Operation Desert Storm, there was no published doctrine on how to fight a MEF or how to fight the deep battle. In fact published MEF doctrine does not exist today. Additionally, neither the organizational structure nor the personnel required for wartime operations exists.

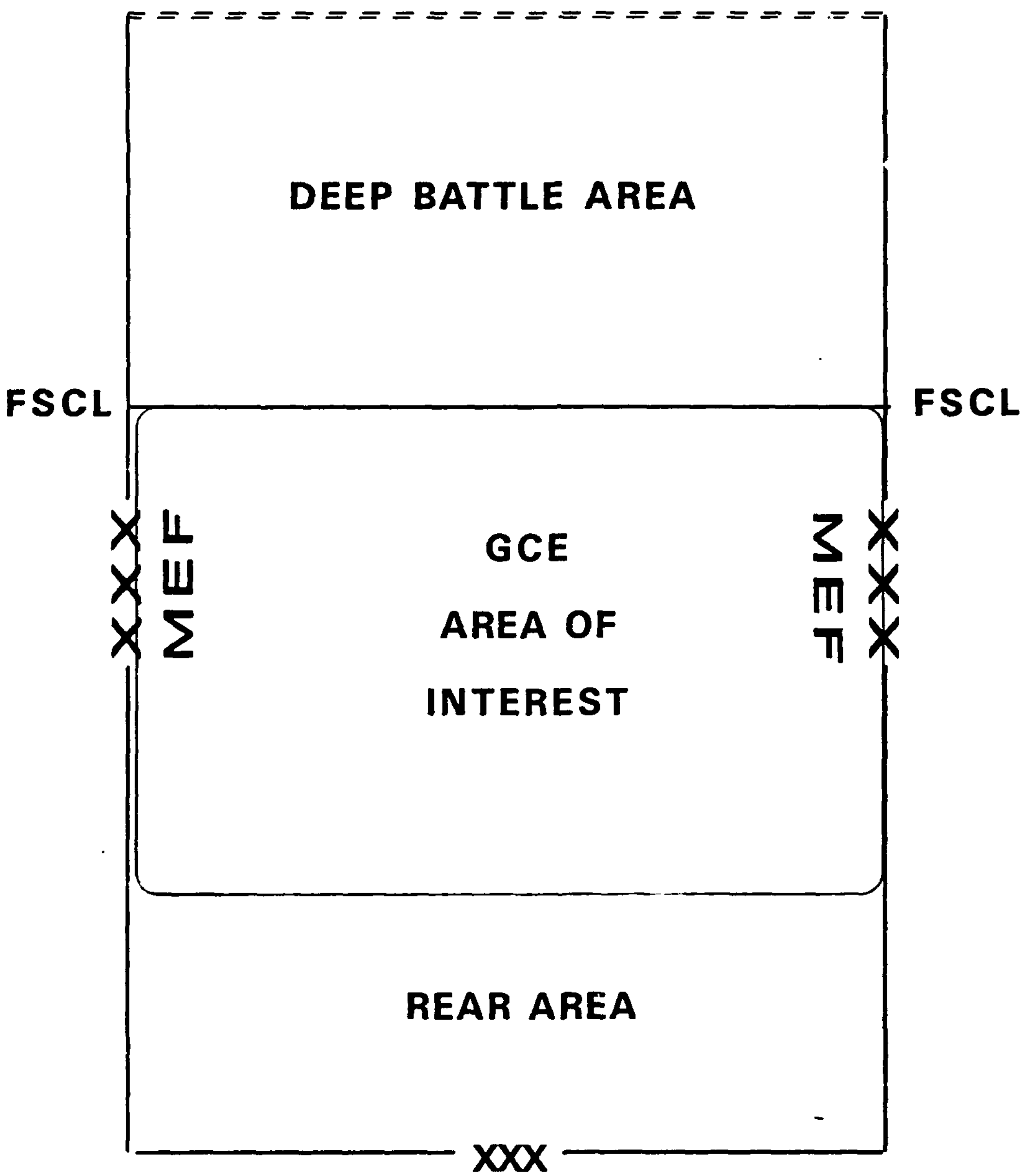


Figure 1 The Deep Battle

The FFCC is the MEF Commander's Warfighting Arm.

This paper will take a look at the Force Fires Coordination Center (FFCC), an agency designed to be the MEF commander's warfighting arm. The paper will attempt to determine where it came from, where it stands today, and where it is headed for tomorrow. It will examine its capabilities with the hope of exposing its deficiencies. Ultimately it will suggest issues for consideration by those who will undoubtedly research this topic in the future. All of this will be done in the context of whether or not the FFCC can provide the MEF commander an agency through which he can shape the battlefield.

THE FFCC FROM A HISTORICAL PERSPECTIVE

What is the Role of Combined Arms in Warfighting?

Marine Corps warfighting doctrine is based on rapid, flexible, and opportunistic maneuver. The aim of maneuver warfare is to render the enemy incapable of resisting rather than to destroy him physically through incremental attrition. Maneuver warfare strives to concentrate fires and forces at decisive points and times to support the commander's scheme of maneuver. Use of fires is essential to conducting successful maneuver warfare.(8:59)

Fire support in maneuver warfare is applied through combined

arms, the integration of forces to place the enemy in a no-win situation: to counter one force, he must make himself vulnerable to another. At lower levels, tactics and techniques are used to achieve a combined arms effect. At higher levels, task organization is used to combine the complementary characteristics of different units' firepower and mobility.

At the Marine Air Ground Task Force (MAGTF) level, assault support is used to concentrate ground forces. Artillery and close air support (CAS) are used as combat multipliers to support ground forces. Deep air support is used to shape the battlefield for tomorrow's fight.

Operation Desert Storm Sparks Requirement for an FFCC

Birth of the FFCC.

During Desert Shield and Storm, General Boomer realized that to be a warfighter and successfully prosecute maneuver warfare, he would require an agency that permitted him access to all systems necessary to shape the battlefield. These systems included intelligence, aviation, logistics, C3, air defense, and fires. No existing agency could access all of these systems. An ad hoc structure was formed that attempted to fulfill the requirement. More than two years after Operation Desert Storm, that fledgling structure has developed into what is now termed the FFCC.

The MEF FFCC was required to coordinate the allocation of fires to support the close battle and actively fight the deep battle. This last statement brings up a fine distinction. What is the difference between an "allocator" and a "warfighter"? The difference hinges on whether the MAGTF commander simply arbitrates disputes between his MSEs while the ground commander determines objectives and scheme of maneuver, or whether he takes a more active role in how the operation is run. In Desert Storm, the MEF commander played the more active role. Consequently, something more than the traditional FSCC was required to fulfill his needs. In short, the MEF commander needed an organization through which he could decide which targets should be attacked, determine the priorities for attacking those targets, and determine how much damage needed to be done to those targets. Additionally, he needed to coordinate with the Commander-in-Chief (CINC) for external fire support needed within the MEF zone and the desired effects on targets outside the MEF zone that might affect MEF operations.

Why an FFCC in Desert Storm?

A common explanation for the organization of a MEF-level coordination center during Operation Desert Storm is that since there were two Marine divisions within the same theater, an organization was needed to coordinate fires between them. According to Major Curt Munson, who was intimately involved with

the formation of the FFCC, this is not true. Artillery coordination between the two divisions was handled by the left and right-most units along the division boundaries. CAS between the two divisions was coordinated through the use of a "push" CAS stack. Aircraft were scheduled into this stack and called for by either division as needed. There was so little naval gunfire available for the divisions that no significant coordination was required. Most of the 80 missions fired by the Navy were in support of Joint Forces Command East (JFC-E).(4:5)

A more accurate explanation for the formation of the FFCC was the MEF commander's need for a warfighting agency. This involved some drastic changes from the routine duties of fire support personnel. Fires took on the role of fighting the deep battle in order to shape the scenario for future battles. The primary MEF-level coordination during Desert Storm was between the close and deep battles.

External to the MEF, the FFCC served two main functions in Desert Storm. The first was the standard fire support coordination that occurred between adjacent commands. In this case, the coordination took place between the MEF, JFC-E, and JFC-N. The principal activity was ensuring that cross-boundary fires did not impact on friendly forces. The second function that the FFCC performed in Desert Storm was response to tasking by the CINC to coordinate fire support for JFC-E. The Target Section coordinated JFACC air support for JFC-E by nominating

JFC-E targets.

FFCC VS. FSCC: A COMPARISON

In the past, the role of the MAGTF FSCC was solely to implement that part of the MAGTF commander's intent which was focused on the deep battle or that part of the battle that lay beyond the area of influence of the Ground Combat Element (GCE) commander. To execute this deep battle, the MAGTF commander would retain operational control (OPCON) of Marine aviation, long-range target acquisition assets, and naval gunfire (NGF) assets, allocating them to subordinate commands as appropriate. The preponderance of the MAGTF FSCC's effort was expended in planning rather than integration of delivery of these supporting arms. The FSCC functioned under the General Staff supervision of the G-3/S-3 and was an advisory and coordinating agency only. It was not vested with command functions and was not charged with actual control or direction of fire support missions.

By contrast, the FFCC is not only involved in the orchestration of the close and deep battles, but is also used by the MAGTF commander to actively fight the war. During Desert Storm, the primary MEF-level coordination occurred between the close and deep battles. The MEF commander, through his FFCC, decided not only how much fire support would be allocated to the close and deep battles, but how and where the effort allocated to

the deep battle would be applied and what the desired effects were. How assets were allocated to the divisions depended on the commanders' requirements to support their scheme of maneuver. The division commanders then determined how those assets were to be used.

In wartime, the best laid plans go astray, and such was the case in Desert Storm. FFCC personnel reported numerous changes that occurred between the time a target was nominated or assigned and when the strike was actually carried out. They also reported that the dividing line between future plans and current operations tended to be indistinguishable at times. Target changes took many forms: targets would become invalid as new intelligence was received, new high-value targets would be found, more or fewer aircraft than planned would actually be available, and NGF would become available (or unavailable). Thus, the MEF FFCC formed the bridge between plans and operations for two reasons: by design, with the Target and FSCC sections; and by necessity, due to the continual changes that formed the FFCC's version of the "fog of war."

MAGTF FIRE SUPPORT ORGANIZATION

The Command Element

The MAGTF FFCC conducts fire support planning and coordination in operations. The MAGTF FFCC develops fire support

plans to support the deep operations portion of MAGTF operations and participates in the planning for joint and combined deep operations. Fire support planning for the close battle is left to the GCE commander. The FFCC coordinates close and deep operations with the GCE FSCC.

The FFCC is responsible for providing damage assessment to the GCE. The GCE uses this information to plan its future operations. It enables the GCE to exploit the success of deep operations.

During actual fire support operations, the FFCC maintains liaison with and disseminates fire support information to the GCE FSCC, the senior agency of the Marine Air Command and Control System (MACCS), and the Rear Area Operations Center (RAOC).

The FFCC is the terminal for GCE fire support requirements. The FFCC receives target nominations and coordinates the GCE's requests for fire support with other agencies. FFCC coordination with the other MAGTF major subordinate elements (MSEs) is depicted in Figure 2.

The Ground Combat Element

The GCE commander conducts fire support operations through his FSCC. FSCCs are established at all levels down to battalion. The FSCCs provide the planning and coordination for fire support operations for their unit. They also integrate fires with the commander's scheme of maneuver. Tactical interface between

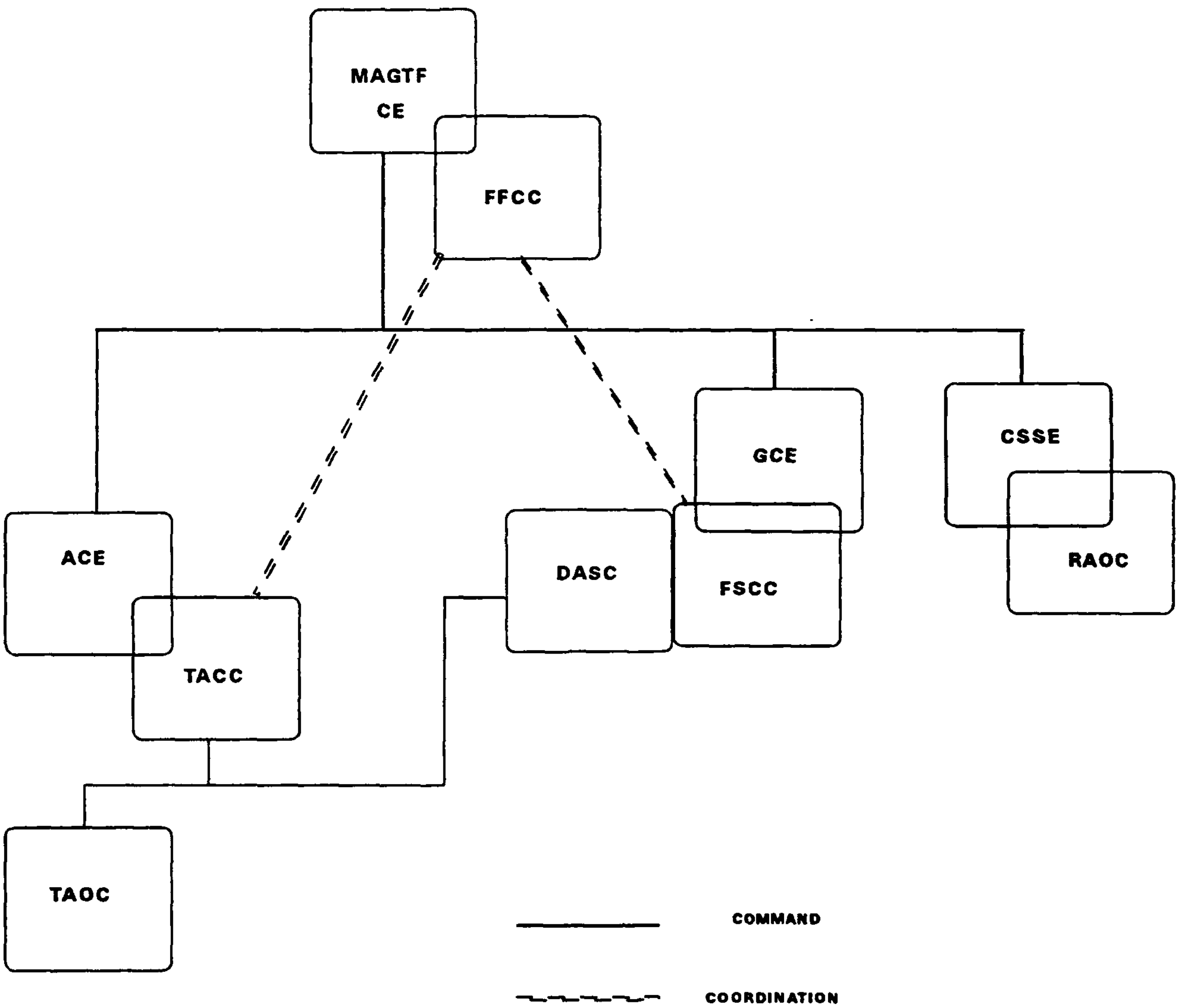


FIGURE 2 FFCC COORDINATION REQUIREMENTS

elements of the GCE and the ACE is done through Tactical Air Control Parties (TACPs) organic to GCE units and the Direct Air Support Center (DASC). Conflicts which cannot be resolved are forwarded to the MAGTF FFCC.

The Aviation Combat Element

The ACE provides the MAGTF commander with his primary means for influencing the deep battle. The ACE commander conducts fire support operations through the MACCS.

The MAGTF and ACE commanders identify apportionment and allocation of air support. Based on the MAGTF commander's guidance, the ACE commander establishes his air tasking order (ATO).

The MAGTF also interfaces with the joint force air component commander (JFACC). Fire support coordination measures and procedures must be coordinated with joint and allied forces for deconfliction.

The Combat Service Support Element

The CSSE commander is responsible for the coordination of rear area operations. There is no formal agency in the CSSE for coordination of fire support. The CSSE usually forms a fire support coordination cell in the RAOC. This cell's primary functions include coordination and clearance of fires in the rear area. The RAOC maintains close coordination with the FFCC for

fire support coordination requirements.

ORGANIZATION OF THE FFCC

Structure of the FFCC

To this point, we have discussed the background and functions of the FFCC. Now let us look at its structure. As previously mentioned, similarities exist between the FFCC and the FSCC. The FFCC's structure, however, reflects some changes based upon the need for the MEF commander to fight the deep battle. Figure 3 details the personnel required to man the FFCC in garrison or combat. If the headquarters goes to war, the personnel listed as *non-chargeable* are included in the Table of Organization to make it complete. These personnel are reservists or Marines from another unit tasked to fill out the complement of members for a wartime FFCC.

The MAGTF commander task-organizes his FFCC with the personnel, equipment, and command and control appropriate to the tactical situation and mission. Figure 4 shows a typical MEF FFCC.

Section Responsibilities and Functions of the FFCC

The entire staff of the FFCC is subordinate to the commander's operation officer (G-3). As the Fire Support Coordinator (FSC) in the Marine division works for the G-3, so the Force Fire Coordinator (FFC) at the MEF works for the G-3.

TABLE OF ORGANIZATION
FOR THE
FORCE FIRES COORDINATION CENTER

LINE NO.	ENGLISH DESCRIPTION	GRADE	MOS	TYPE	MARINE OFF	MARINE ENL	NAVY OFF	NON-CHARGE OFF	NON-CHARGE ENL
120	**FORCE FIRES COORD CENTER**								
120A	FORCE FIRES COORD OFFICER	COL	9906	O	1				
120B	ASST FFC OFFICER	LTCOL	0802	O	1				
120C	FORCE FIRES CHIEF	MGYSGT	0861	E		1			
121	**TARGET INFORMATION SECTION**								
121A	TARGET INFORMATION OFFICER	LTCOL	0802	O	1				
121B	ASST TARGET INFO OFFICER	MAJ	9965	O				1	
121C	TARGET INFORMATION CHIEF	GYSGT	0861	E		1			
121D	ASST TARGET INFO CHIEF	SSGT	0861	E					1
121E	FILES CLERK	CPL	0151	E		1			
121F	FILES CLERK	LCPL	0151	E					1
121G	TARGET PLOTTER	CPL	0861	E		1			
121H	TARGET PLOTTER	LCPL	0861	E					1
121I	ASST TARGET INFO OFFICER	MAJ	0802	O				1	
122	**PLANS SECTION**								
122A	PLANS OFFICER	LTCOL	0802	O	1				
122B	NAVAL GUNFIRE PLANS OFF	LCDR	1100	O			1		
122C	FIXED WING AIR PLANS OFF	MAJ	9965	O	1				
122D	FIXED WING AIR PLANS OFF	CAPT	9965	O				1	
122E	PLANS CHIEF	GYSGT	0861	E		1			
123	**FIRES SECTION**								
123A	FIRES OFFICER	LTCOL	0802	O	1				
123B	ASST FIRES OFFICER	MAJ	0802	O				1	
123C	NAVAL GUNFIRE OFFICER	LCDR	1100	O			2		
123D	WATCH OFFICER	MAJ	0802	O	1				
123E	WATCH OFFICER	CAPT	7565	O				1	
123F	ASST FIRES OFFICER	MAJ	9965	O				1	
124	FIRES WATCH CHIEF	MSGT	0861	E		1			
124A	ASST FIRES WATCH CHIEF	GYSGT	0861	E					1
124B	JOURNAL CLERK	SGT	0861	E		1			
124C	JOURNAL CLERK	CPL	0861	E					1
124D	PLRS CLERK	CPL	0861	E		1			
124E	PLRS CLERK	CPL	0861	E					1
124F	SCOUT/OBSERVER/DRIVER	CPL	0861	E		1			
124G	SCOUT/OBSERVER/DRIVER	LCPL	0861	E					1
124H	PLOTTER/DRIVER	CPL	0861	E					1
124I	PLOTTER/DRIVER	LCPL	0861	E		1			
SECTION TOTALS					7	10	3	6	8

Figure 3

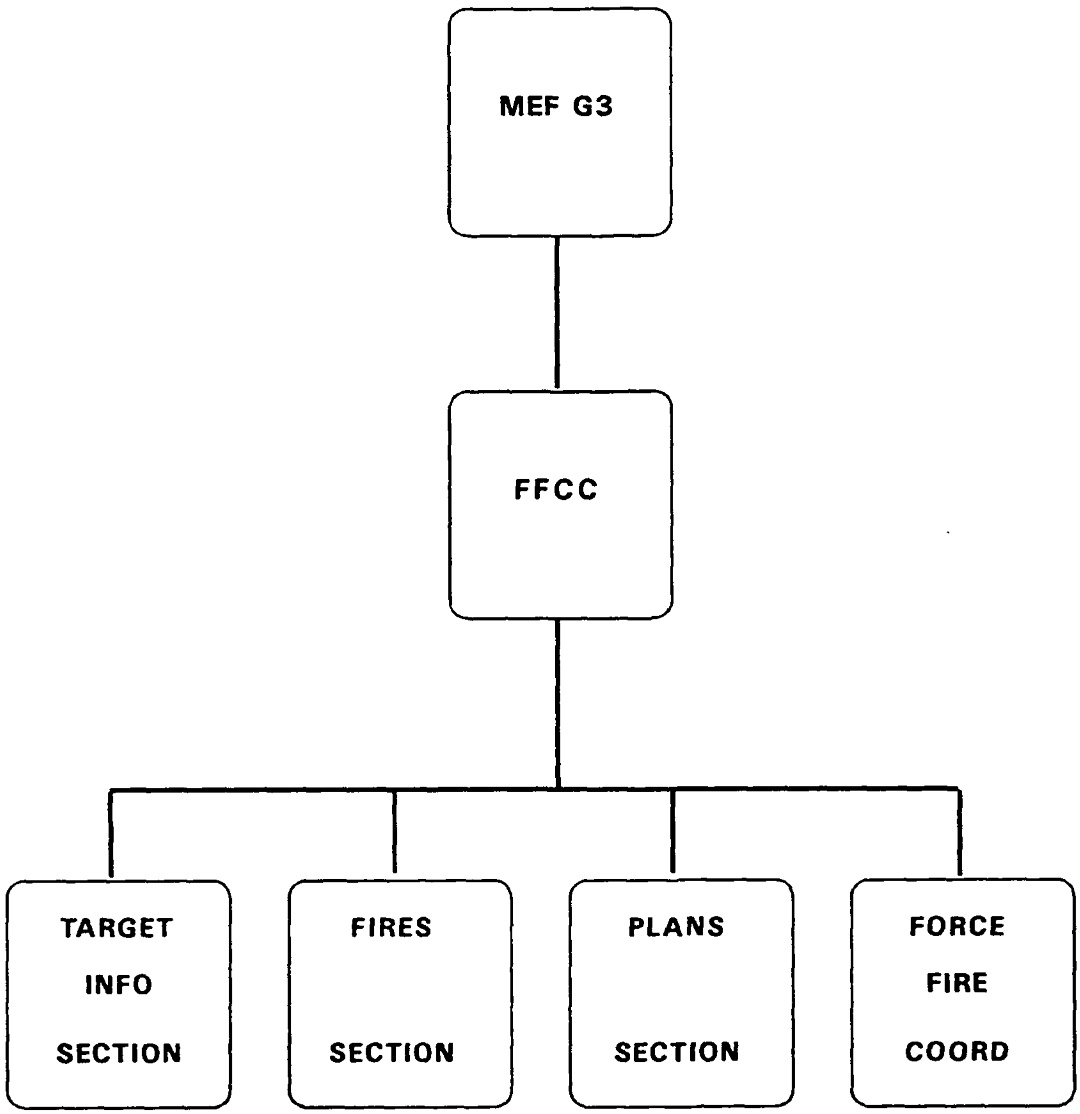


Figure 4 FFCC Organization

The FFCC consists of four sections: the Target Information Section, the Fires Section, the Plans Sections, and the Force Fires Coordinator. The Target Information Section sets the FFCC apart from the FSCC. The commander has the opportunity to shape the battlefield, but this targeting section is concerned with deep battle and close battle targets. It considers all attack options and the full range of operations that might improve the conditions under which the current and future battle will be fought. Its focus is the enemy and his ability to interfere with the MEF's plans and objectives.

The Target Information Section interacts with the Fires Section for the close battle and with the Plans Section for the deep battle. To ensure all actions and capabilities are considered, the Targeting Information Section will head a targeting board which will include those personnel listed in Figure 5. These personnel will provide to the commander their experience to ensure proper targets are sorted, validated, prioritized, and attacked with the primary result of shaping the battle as the commander sees fit.

The Fires Section includes air, artillery, and NGF assets. It is responsible for immediate targeting requirements and coordination and deconfliction of fires. This part of the operation most closely resembles the old idea of the FSCC. The Fires Section conductcoordination and liaison required to execute the close battle. Using the fire support

TARGETING BOARD PERSONNEL

FORCE FIRES COORDINATOR

G-2 REPRESENTATIVE

G-3 REPRESENTATIVE

TARGET INFORMATION OFFICER

TARGET INTELLIGENCE OFFICER

AIR OFFICER

ELECTRONIC WARFARE OFFICER

NBC OFFICER

AIR DEFENSE OFFICER

ENGINEER REPRESENTATIVE

G-4 LOGISTICS REPRESENTATIVE

NAVAL SURFACE FIRE SUPPORT OFFICER

OTHER AS NEEDED

PSYCHOLOGICAL OPERATIONS OFFICER

DECEPTION OFFICER

SOF REPRESENTATIVE

STAFF JUDGE ADVOCATE

Figure 5

doctrine of coordination at the lowest level, the Fires Section will only be used to coordinate fires when it is absolutely required. Even with coordination between two divisions, the Fires Section will not normally interfere since its focus will be on the MEF Commander's interaction with the other component commanders.

The third section of the FFCC is Plans. This section uses the experience of artillery, naval gunfire, and aviation personnel to ensure the future battle is well executed. All weapon systems will be considered since the future battle of today will, tomorrow, be our close battle.

The FFC controls and coordinates the employment of the other three secctions. He is involved in both developing and executing plans, and therefore serves as a crucial bridge between these two phases. As stated above, the FFC allows the MAGTF commander to coordinate both the close and deep battle.

For the close battle, the GCE forwards target requests to the FFCC. These are entered into the cyclic targeting process. Depending on the priority of the target and the effect desired, the FFCC can either assign the target to the ACE, or nominate it to the Joint Targeting Board operated by the JFACC. CAS missions are coordinated through the DASC, which is usually co-located with the division's FSCC. If no air power is available, or if the target is not suitable for an air strike, it can be handled by the Fires Section. This section also implements and

disseminates the fire support coordination measures. For example it ensures that the GCE commanders are aware of any changes to the FSCL.

The principal agent for planning the deep battle is the Target Section. The G-3 Plans Division will provide the MAGTF commander's direction, intentions, and requirements, which the Target Section translates into target nominations and assignments. Target intelligence and battle damage assessment (BDA) are provided by the G-2 Target Intelligence Officer.

Functions of the FFCC

The following are proposed functions of the FFCC.

1. Integrate and control deep fires.

2. Coordinate employment of surface and air delivered weapons within the MAGTF area of operations.

3. Coordinate with the senior element of the Marine Air Command and Control System (MACCS).

4. Monitor the ATO cycle.

5. Maintain coordination with the fires agencies of the MSCs.

6. Provide representation to the Joint Targeting Board and the JFACC in joint operations.

7. Submit target nominations to CJTF for attack using joint assets.

The FFCC coordinates fire support for the close battle in

the following manner:

1. Coordinates separation of fires between the close and deep battle areas.

2. Plans fires and electronic warfare required to provide close battle area security using organic MAGTF or other agencies assets.

3. Coordinates the use of fires assets which are attached to the MAGTF from outside agencies.

4. Coordinates apportionment of Marine air between the various types of tactical mission assignments.

5. Allocates Marine air in support of the close battle.

6. Provides liaison to higher and adjacent headquarters to nominate close battle targets for attack.

The FFCC conducts the fire support portion of the rear battle. It provides the following coordination measures between the MEF and the rear area commander:

1. Recommends fire support organization required to support current threat level in the rear area.

2. Coordinates rear area security fires with higher, adjacent, lower, allied, and host nation agencies from the RAOC.

3. Plans appropriate fire support coordination measures for rear area security.

4. Integrates and controls fires in the rear area.

ISSUE FOR THE FUTURE

One of the important issues that is pertinent to the operation of the FFCC is the dissemination of the ATO. This document is essential to the successful execution of the FFCC's mission. As we saw in Desert Storm, the ATO process is far from perfect. Participants at the 1992 Air Command and Control Joint Operations Seminar concluded that the joint ATO system used in Desert Storm was not flexible enough to meet the needs of the MAGTF. The fact that the ATO planning process was based on a 72-hour period was hailed as a large part of this problem. For the FFCC, the future battle is defined as 72 hours and beyond, while the present battle takes place well within 72 hours. This means that while the ATO process may take part of the future battle into account, it is not far reaching enough, and it is woefully inadequate to deal with the present battle. The strike record on fixed targets was relatively good, but moving targets were often missed or not reattacked because they had moved on in the interim.

Other problems with the ATO process highlight the need for a liaison between the FFCC and JFACC, such as late taskings, availability or unavailability of air assets, or simple things such as a delay in the distribution of the ATO or some questions on detail.

In Desert Storm, changes to the ATO for a given day could

accumulate to such a degree that the planners would fall far behind in disseminating any product that the warfighters could use. Perhaps the largest impediment to the dissemination of the ATO in Desert Storm was the service's use of message systems which were not compatible with each other. Between the complications caused by differing equipment and dissimilar protocols, getting the ATO every day could become a monumental task.

Summary

The Force Fire Coordination Center is the agency through which the MEF commander can access all systems required to shape the battlefield. This paper provided background and real world experience during Desert Storm. As a result we have recommended an organization and some basic functions of the MEF commander's warfighting arm.

BIBLIOGRAPHY

1. Joint Tactical Command, Control and Communications Agency. *Joint Fire Support Operations, JTC3A Report 8016.* Oct 1990.

2. Lyons, Dwight and Munson, Maj Curtis A., "Who Fights the MAGTF?" *Marine Corps Gazette,* June 1992: 28-31.

3. Munson, C.A., Major, USMC. Personal interview, MCCDC. 3 Nov 1992.

4. Munson, Major C.A. and Lyons, H.D., "Fire Support and Fire Support Coordination During Operation Desert Storm." Unpublished paper, Jul 1991.

5. Schopfel, J.K., Colonel, USMC. Personal interview, MCCDC. Jan 1993.

6. United States Marine Corps. *Fire Support Coordination by the MAGTF Command Element, FMFM 2-7-1.* Jul 1992.

7. United States Marine Corps. *Fire Support in Marine Air-Ground Task Force Operations, FMFM 2-7.* Sep 1991.

8. United States Marine Corps. *Warfighting, FMFM-1.*

9. Van Riper, BGen Paul K., "Observations During Operation DESERT STORM." *Marine Corps Gazette,* Jun 1991: 55-61.

10. Venable, M.P., Master Gunnery Sergeant, USMC. Personal interview, MCCDC. 3 Nov 1992

MARINE CORPS COMMAND AND CONTROL DOCTRINE-WHERE IS IT? COMING TO A BASE NEAR YOU

Submitted to
Maj Marshall Snyder
and Mrs. Sandra Kirkpatrick
at the Communications Officers School
Quantico, Virginia

Captain Melissa Schneider, USMC
Captain Gary Bloesl, USMC
Captain Steve Tucker, USA

8 April 1993

MARINE CORPS COMMAND AND CONTROL DOCTRINE-WHERE IS IT? COMING TO A BASE NEAR YOU

OUTLINE

Thesis: Doctrine Division can only approach Fleet Marine Force (FMF) expectations for timely and accurate doctrine with increased organizational support, budget, staffing, and decentralization of draft responsibilities.

I. THE "WINDS OF CHANGE"
   A. National Military Strategy Upheaval
   B. Technology's Impact
   C. Reactions to Strategic Flux

II. MARINE CORPS COMBAT DEVELOPMENT COMMAND'S IDENTITY CRISIS
   A. Concepts Based Requirement System Version 3.0
   B. Combat Development Process Saga
   C. The Mythological Hydra
   D. Ambiguous Command Relationships
   E. A Concept Revolution

III. DOCTRINE DIVISION DIFFICULTIES
   A. Dependency
   B. Creating a Publication
   C. People, Money, Computers

IV. RECOMMENDATIONS
   A. Doing More with Less
      1. Decentralizing Authorship Responsibilities
      2. Adopting Other Service Doctrine
      3. Doctrine Division as Manager
   B. Tying Up Loose Ends
      1. Speeding Up CDP Adoption
      2. Realistic Expectations

MARINE CORPS COMMAND AND CONTROL DOCTRINE-WHERE IS IT? COMING TO A BASE NEAR YOU

Fifty-five years ago the development of amphibious doctrine and its subsequent validation in World War II ensured our independence as a separate service. From 1933 to 1934, Marine Corps schools were devoted to solving this doctrinal identity crisis.(8:80) Maintaining a robust and unique doctrine today is no less vital to the Marine Corps' survival as it was then. Many say we are in the midst of a doctrinal crisis again. However, our inability to produce, maintain, and update doctrine **quickly** characterizes the current dilemma. Presently, much of Marine Corps doctrine is intuitive and experiential, not codified in formally published documents. Our doctrine and its production apparatus appear to have atrophied over the last fifteen years. Publications remain in the production pipeline from several months to several years. On the surface, it would appear that those in charge of doctrine just are not doing their jobs. However, there are many more complex issues involved.

Several months ago we were tasked with finding Command and Control doctrine. FMFM 3, the command and control capstone document, answers this request. However, FMFM 3's

evolution indicates continued serious problems with producing **quality doctrine** in a **timely** fashion. Further, research exposes a gross ignorance in the Fleet Marine Force of the complexities involved in producing doctrine, exacerbating perceptions that doctrine production is stagnant. Simply stated, Doctrine Division can only approach FMF expectations for timely and accurate doctrine with increased organizational support, budget, staffing, and decentralization of draft responsibilities.

Many factors contribute to this state of affairs. These factors can be divided into those within the Marine Corps' control and those outside our control. Factors beyond our control are current changes in the focus of the national military strategy and the continuing impact of new technology on the battlefield. Those within our control are the turmoil and confusion within Marine Corps Combat Development Command (MCCDC) resulting from numerous reorganizations, the most recent in preparation for transition to the Combat Development Process (CDP). This reorganization has left an ambiguous chain of command which still lacks the philosophical foundation, the CDP, to ensure unity of effort. Negative factors within Doctrine Division are an unrealistic table of organization, inadequate budget, draft responsibilities which exceed personnel capabilities, and lack of an effective prioritization system.

Development of FMFM 3 illustrates all of these problems. We feel current system weaknesses should disappear with final transition to the CDP. However, it may be six months to a year before the transition is complete and operations are running smoothly. Yet, improvements can be made now to organizational support and Doctrine Division draft responsibilities. We recommend the following:

- -Establishing an interim manually coordinated prioritization system across divisions;
- -Improving communication and coordination across divisions;
- -Speeding up transition to the Combat Development Process;
- -Decentralizing authorship responsibilities; and
- -Maximizing adoption of other service doctrine.

Suggestions such as closing Marine Corps Schools for a year so staff and students can write doctrine as done in 1933 would only address the symptom, not the illness. Our recommendations provide a long term cure ready for the challenges of the future.

THE "WINDS OF CHANGE"

National Military Strategy Upheaval

Currently evolving doctrine is being buffeted by the "winds of change" as the United States reevaluates its national military strategy. Roles and missions are being reviewed. "Jointness" is rapidly becoming the rule rather

than the exception. The services are more and more likely to be assigned non-traditional roles like the humanitarian operation in Somalia. Thus, the Marine Corps' niche in "the big picture" is changing just as the picture's landscape is changing.

Technology's Impact

Further complicating the production of doctrine is the rapid evolution of technology as we integrate new systems on the battlefield. Advances in communications, guided munitions, and navigation systems have sped up the pace of battle. The speed and plethora of information have inundated commanders and altered their approach to the battlefield, requiring innovative solutions to the information overload. Consequently, C4I2 systems and procedures are being developed to deal with the challenges of information collection and dissemination. However, military systems and planners have fallen outside the technological "OODA loop" and are scrambling to keep up with the pace of technological change.

So how do the evolving military strategy and technological explosion impact doctrine development in the Marine Corps? Simply, doctrine documents the tremendous amount of **rapid change** occurring. Recent conferences are exploring the emerging role of naval expeditionary forces where, "forward presence of U.S. forces will be useful in forestalling regional conflicts, in alleviating trouble

before it becomes a full-blown crisis." Further, the conferences have concluded, "naval expeditionary forces are well-suited to this emerging security environment."(5:53-55)

Reactions to Strategic Flux

Validating these themes is the Navy and Marine Corps White Paper "...From the Sea" which defines a new combined vision for the two services. Two points are of interest. First, command, control, and surveillance were listed as one of the four key operational capabilities required to successfully execute this **new direction** for the Navy and Marine Corps. Secondly, a Naval Doctrine Command was established emphasizing that, "Integration on the battlefield starts with integration of doctrine and training."(13:22) Further, it states that the new command will, "close the gap between the air-land battle and amphibious warfare...."(13:22) All of this has tremendous implications for the Marine Corps' current doctrine, doctrine in development, and new doctrine that will be required to assimilate all of this change.

As such, FMFM 3 is an excellent example of doctrine formed in strategic flux. In Chapter Four of the Coordinating Draft of FMFM 3, Marine Corps command and control methods are modeled after the Navy's Copernicus structure and emphasize interoperability between the Marine Corps and the Navy using principles in "...From the Sea."

However, during conferences reviewing FMFM 3, legitimate concerns were raised regarding the Marine Corps' history of sustained operations ashore. The concerns were significant because the Navy's command and control structure differs from the Army's, and sustained operations ashore require extensive interface between the Marine Corps and the Army. The need for dual compatibility was not addressed in the publication. The omission was highlighted again by the Doctrinal Review Board who ordered revision of the chapter.(14:1) Thus, a shift in strategic role emphasis overshadowed the need to account for historical operational precedents.

MCCDC's IDENTITY CRISIS

Concepts Based Requirement System Version 3.0

Having considered factors beyond the Marine Corps' control, let us consider factors we do control. Doctrine is not created in a vacuum. In the Marine Corps, doctrine is actually just one of many endproducts of what **was** the concepts based requirement system (CBRS). Once again, Marine Corps Combat Development Command has overhauled the CBRS. Now the CBRS is only the front end of the newly adopted Marine Corps Combat Development Process. Thus, a full understanding of the Marine Corps' current shortfalls in doctrine requires understanding MCCDC's struggle with developing an efficient system and organizational structure.

Appendix 1 illustrates the original CBRS depicted in the MAGTF Warfighting Center's Standing Operating Procedures of 1988. Obviously, this system was quite lengthy and unwieldy. Upon assuming duty as Commandant of the Marine Corps, General Mundy appointed a Combat Development Planning Group to study the Marine Corps's system(s) for facilitating and integrating change in the Corps (procurement, training and education, doctrine, etc.). The CDP was the result of this study. This new process is the engine that will drive the integration of change into doctrine, training and education, organization, equipment, facilities, and support.(2:1) However, the CDP's lengthy development and adoption is one of many factors hindering efforts to correct doctrinal shortfalls.

The Combat Development Process Saga

Why is CDP development and adoption taking so long? Primarily, because the process which attempts to integrate planning, programming, budgeting, execution, and life cycle management into a single vehicle is extremely ambitious. The Marine Corps will field capabilities rather than independent pieces of equipment that previously lacked the doctrine, training, and organizational adjustments necessary to successfully field the equipment . A capability is a package consisting of **doctrine**, training and education, equipment, and organization. For example, the process will eliminate a situation where a machine gun requiring a two-man crew, new

ammunition, and increased range would hit the FMF without the new employment doctrine and tactics, the new table of organization, and any specialized equipment.(2:1) Obviously developing a capability is much more difficult than developing an individual piece of equipment or concept.

The comprehensiveness of the program has required the creation of new systems, new vocabulary, and most importantly, new ways of thinking. Now, every step of the process is being analyzed, reviewed, and reconfigured (inputs/outputs) as necessary. Information requirements, information flow, and elimination of redundancy are the focal points of the process. This analysis, review, and reorganization is extremely manpower and time intensive.

The process requires development of a new vocabulary and redefinition and clarification of the old Warfighting Center vocabulary. The Marine Corps wrangles with its own version of "political correctness" and consumes time debating semantics. However, MCCDC is in desperate need of a standard vocabulary when communicating across divisions, and therefore, must cope with this necessary evil.

Finally, resistance to change, whether vocabulary or methods, is endemic to the Marine Corps and its devotion to tradition. There are many who think the old way of doing things was just fine. Thus, the program must be taught, modified, and sold as it is developed. Changing old habits

and philosophies can be the greatest challenge of all.

The Mythological Hydra

Unfortunately, the key to making the process a success, a tracking system, is still under development. To better understand the importance of a tracking system, a general description of the process is helpful. Figure 1 outlines the process's basic architecture.(2:1)

COMBAT DEVELOPMENT PROCESS

*CMC PLANNING GUIDANCE *DEVELOP THE CONCEPT *ESTABLISH/ASSESS CAPABILITIES *DETERMINE THE REQUIREMENT	CONCEPT BASED REQUIREMENTS SYSTEM (CBRS)
*MEET THE REQUIREMENT -DOCTRINE -EQUIPMENT -TRAINING -EDUCATION -ORGANIZATION -FAC/SUPPORT	SOLUTION DEVELOPMENT SYSTEM (SDS)
*SUPPORT THE CAPABILITY -UPDATE -REVIEW -MAINTAIN	CAPABILITY SUPPORT SYSTEM (CSS)

Figure 1

Three systems comprise the process: a concepts based requirement system (CBRS), a solution development system (SDS), and a capability support system (CSS).

The CBRS is responsible for taking the Commandant's Planning Guidance, developing the necessary concepts to support the guidance, establishing and assessing capabilities

to fulfill those concepts, and determining the deficiencies in those capabilities. These deficiencies are forwarded as requirements to the implementing divisions and commands responsible for doctrine, training, education, organization, equipment, facilities, and support. These implementing divisions and commands produce the solution portion of the process. The solution then passes on to the capability support system once it is fulfilled where maintenance, review, and update occur as necessary.(2:1)

For example, a new capability for special operations is identified that requires a new piece of equipment. Deficiencies are noted in concepts, doctrine, training, and equipment. Each division receives a Requirement Needs Statement to fulfill its portion of that capability deficiency. This is where the tracking system is critical. Concepts may have a total of five requirements, doctrine three, training two, and requirements one. The tracking system allows prioritization of capability deficiencies and ensures the requirements needed to field that **capability** are prioritized accordingly **across** divisions. Thus, implementing divisions' products are Marine Corps' established priorities and not individual division priorities. Warfighting Development Integration Division is the likely candidate to oversee the tracking system.

Frustrating the establishment of an automated tracking system is absence of the necessary computer hardware and software. Additionally, the types and frequencies of reports, as well as those of the data transfer process, have yet to be determined. Also, the exact nature of data analysis and assessment that would be performed by Integration Division is still evolving.

Currently, even a manual tracking system does not exist. Divisions prioritize and track their own requirements with minimal coordination among divisions to ensure unity of effort. Each division is like a separate head on the body of MCCDC. Comprehensive SOP's and appropriate orders delineating division responsibilities and liaison to mitigate tracking deficiencies also do not exist. A Marine Corps order establishing and detailing the CDP is scheduled to appear this summer. Until an effective tracking system, coordinating methods, and written orders exist, MCCDC will continue to operate like the mythological Hydra it currently resembles.

Ambiguous Command Relationships

Aggravating tracking deficiencies are ambiguous command relationships. Clearly established lines of communication and coordination, i. e., command relationships, are integral to effective and timely mission accomplishment. However, MCCDC's structure has suffered constant flux since MCCDC's

inception in 1988. Each reorganization has attempted to rectify this debilitating characteristic. With each reorganization, valuable time, effort, manpower, and resources have been expended with no clear results. This is true of MCCDC's current structure which still misses the mark. Figure 2 on the following page outlines the current structure.

MARINE CORPS COMBAT DEVELOPMENT COMMAND ORGANIZATION

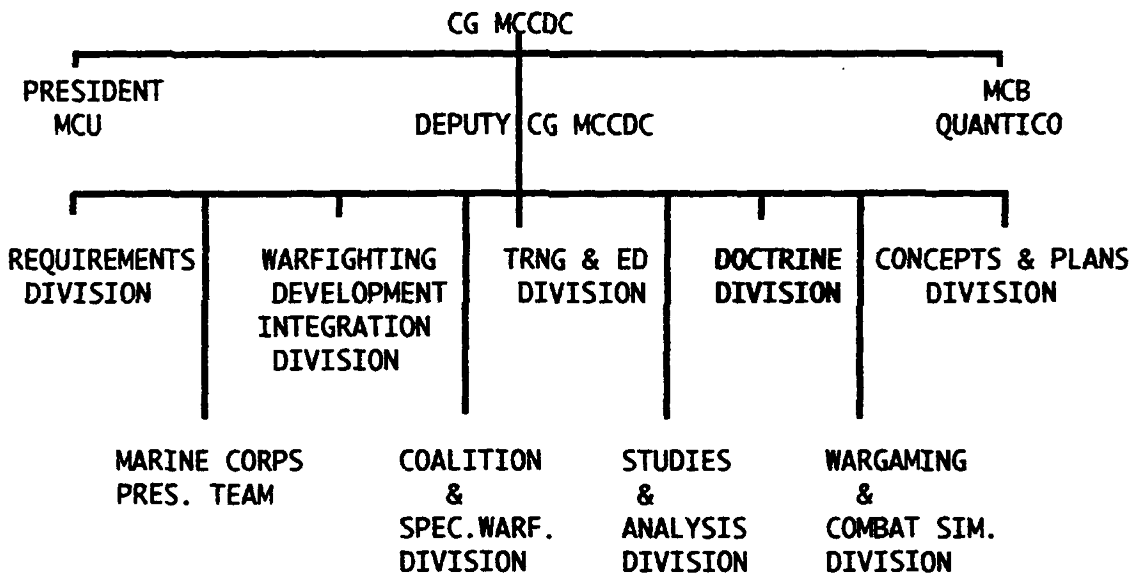


Figure 2

This structure's only benefit is providing divisions direct input into the Commanding General and making his influence more accessible. That is, if a division solicits input or responses from the Fleet, these requests receive more legitimacy and power by virtue of a lieutenant general's signature. Yet, for tracking, coordinating, and

accounting purposes, this structure violates the basic premises of a chain of command. Integration Division, which will ultimately orchestrate all of the divisions' efforts, is **not** in their direct chain of command. Having a lateral position in the chain of command reduces the Integration Division's ability to effectively coordinate priorities and resolve conflicts. Also, this horizontal chain of command creates no single point of contact for the other two commands at Quantico. If Integration Division is to oversee the resolution of Marine Corps capability deficiencies, it must occupy a senior level in the chain of command to be optimally effective.

The development of FMFM 3 is a clear example of not understanding the CDP architecture and the coordination vital to making the process a success. During January of 1992, Doctrine Division was directed to make the Command and Control capstone document its next priority. Capstone documents lay the philosophical foundation for a particular topic and provide a comprehensive synopsis of that doctrinal area. Subsequent documents under the capstone document provide additional detailed information concerning tactics and techniques in that functional area.

However, before developing a capstone document, Doctrine Division required a description of the Marine Corps' ideas about command and control. Concepts and Plans Division,

however, was not focusing on that type of concept at that time. In fact, Concepts and Plans Division was reevaluating its mission following the Warfighting Center's disbandment in August 1992.(7:1) Thus, Doctrine Division had to spend one month developing a concept on its own. Now, eight months later, Concepts and Plans Division has caught up to Doctrine Division and is providing them with a concept for a manual nearing publication. Obviously, valuable time was consumed and duplication of effort occurred. Currently, divisions act to minimize current weaknesses via ad hoc coordination and further refinement of internal procedures.

A Concept Revolution

An example of one division's efforts is the focus of concept development, the foundation of the CDP. Concept focus has greatly shifted in the last six months. Prior to the reorganization, Concepts and Plans Branch primarily developed narrow concepts such as non-combatant evacuation operations with specific conditions from which operational plans and orders could be developed. Broad concepts from which warfighting tenets (such as those contained in FMFM 1) and the supporting tactics, techniques, and procedures could be developed were handled by Doctrine Division as required. Concurrently, rapid changes in the global environment and technological applications created a "concept vacuum." Because the Marine Corps misdirected Concepts and Plans Division's concept focus, the system was inefficient at

best and slowed doctrine production. However, in the last six months a concept "revolution" has occurred within Concepts and Plans Division and its personnel have done the seemingly impossible: defined their role within the CBRS and shored up the conceptual framework upon which the Marine Corps is built.(7:1)

Figure 3 on the following page shows the result of their work and organizes a workable conceptual framework of the Marine Corps on which to base all peripheral operational concepts like command and control. It covers the spectrum of anticipated areas of operation: operational maneuver from the sea (OMFTS), expeditionary operations, and sustained operations ashore (SOA). Beneath these warfighting and operational concepts fall the functional concepts, i. e., the tools with which our warfighting and operational concepts are built. Unfortunately, this codified conceptual framework has only existed for a short time, and therefore, has had minimal impact on the implementing divisions as exemplified by the debate concerning sustained operations ashore in Chapter Four of FMFM 3.

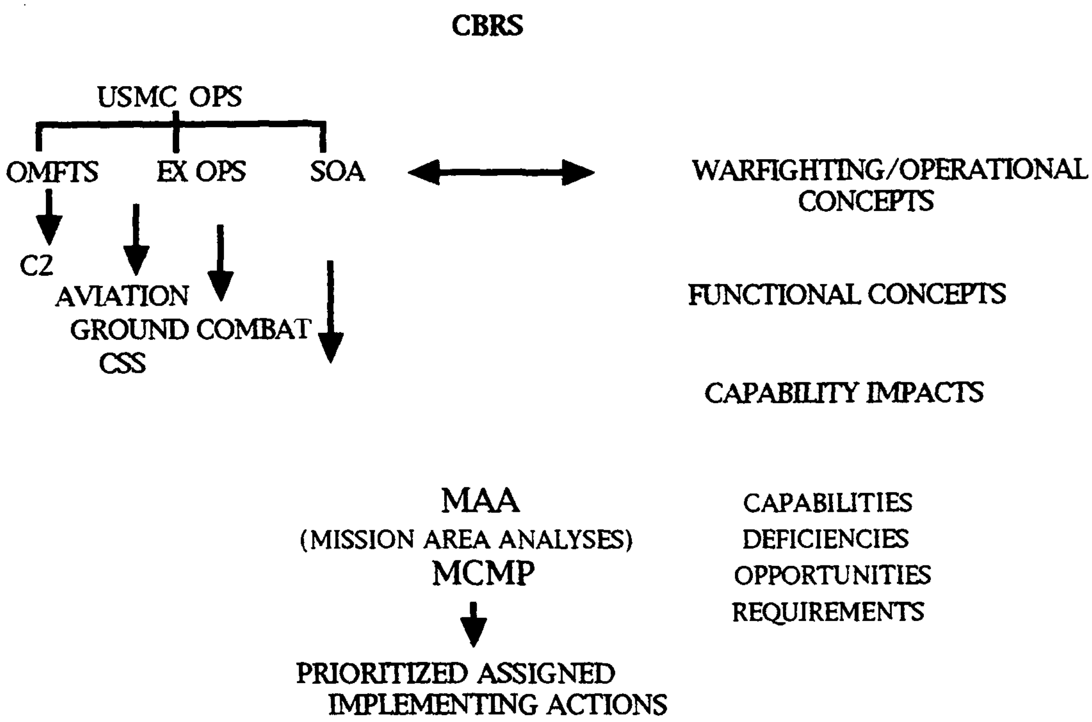


Figure 3

DOCTRINE DIVISION DIFFICULTIES

Dependency

Obviously, the content and timeliness of concept development impact Doctrine Division's ability to produce doctrine in a **timely** and **efficient** fashion. Doctrine Division is dependent upon the CBRS working. Doctrine is driven by mission need statements (MNS) forwarded from Requirements Division. Requirements Division develops MNS's from Marine Corps Lessons Learned (MCCLS), fleet operational needs statements (FONS), mission area analyses, CINC's list of priorities, and the Marine Corps Master Plan (MCMP). MNS's requiring development of a new publication or revision of an old one generally take eighteen months to accomplish.

Currently, no published timeline outlining document development exists.

Creating a Publication

MNS's are directed to the appropriate section within Doctrine Division. The doctrine development process appears to have eleven basic steps as illustrated by Figure 4.

EVENT	BRANCH HEAD	SECTION HEAD	ACTION OFFICER	EDITOR	REMARKS
1. ASSIGNMENT	A	X			
2. POA&M	A	A	X	C	PURPOSE/SCOPE MILESTONES
3. GEN. OUTLINE	A*	A	X	C/R	
4. RESEARCH		C	X		AD HOC/CIV CONTRACTOR
5. DETAILED OUTLINE	A*	A	X	C/R	STAFFED BY MSG
6. COORD. DRAFT			X	C/R	
7. REVIEW	X*	X	X	C*	DRB/STAFFING
8. REWRITING			X	C/R*	
9. EDITING	A	A	X	X	
10. APPROVAL	X	X	X	X	SIGNED BY CG, MCCDC OR CMC
11. PRINTING/DISTRIB.			C	X	

X=ACTION R=REVIEW A=APPROVAL C=COORDINATION *=AS NECESSARY

Figure 4

First, the MNS is studied to determine whether correction or revision to an existing publication will suffice. If not, the Division calls for a new publication to be drafted and an action officer is assigned. In step two, the action officer drafts a plan of action and milestones. This document includes preliminary information on purpose and scope and projections for TAD budgeting, conference scheduling, and editor/illustrator coordination. Normally, an editor is assigned here to assist the action officer.

Steps three, four, and five include drafting a general outline, conducting research, and preparing a detailed outline after the plan of action and milestones have been approved. Research is continuous in the publication development and refinement process. The action officer may make use of a team or external agency like the Amphibious Warfare School to assist in the research effort. Staffing the detailed outline ensures that all interested parties find the proposed doctrinal solution appropriate in scope, approach, and organization. Staffing gives the FMF and other interested parties an opportunity to recommend additional topics for inclusion, a differing approach, or a change in direction or emphasis for the manual. Staffing may take anywhere from six to twelve months. Providing doctrinal input is not always a Fleet priority. This attitude results in delays and an extended staffing timeframe.

Steps six, seven, eight, and nine cover coordinating drafts, review, rewriting, and editing. The coordinating draft is the preliminary document for a new publication and is distributed to many FMF organizations and Landing Force Training Commands. The coordinating draft is also reviewed by the Commandant's Doctrinal Review Board (DRB). Results from the board form the basis for revisions before the draft is republished as a draft FMFM or OH. As developmental products, FMFM's and OH's are precursors to approved Service doctrinal publications and require a final validation by the FMF. Editing occurs throughout the entire process. The

action officer submits the draft for several informal editorial rewrites throughout the process incorporating recommendations concerning readability, format, and structure.

The final two steps involve approval, printing, and distribution. The CG, MCCDC, forwards doctrinal publications for the Assistant Commandant's and Commandant's approval. Upon approval, the publication is returned to the Publications Section for printing and distribution with HQMC.(9:4.21)

People, Money, Computers

Creating a publication is obviously an involved and laborious process. Compounding development difficulties are unrealistic staffing, insufficient budget, and software and hardware incompatibilities. Each doctrinal section generally has one action officer excluding occasional reservist augmentation. Thus, one officer may be responsible for producing as many as ten to fifteen publications, as well as reviewing all documents within that doctrinal area. Doctrine Division is responsible for 389 Marine Corps, Joint, and Allied publications. Currently, 89 of the 276 Marine Corps publications are in various stages of draft or revision. Additionally, Doctrine Division personnel are also responsible for a myriad of other tasks such as preparing the MCBUL 5600 series, the Publications Master Plan, and publication distribution lists.(9:4.25) Twenty-seven officers, two enlisted, and fourteen civilians, equaling 83%

of the division's authorized personnel, are currently tackling these challenges.(14:1)

Doctrine Division also suffers from an inadequate budget. Only 2.6% of MCCDC's budget is allocated for those divisions that formerly comprised the Warfighting Center. Doctrine Division receives 38% of that amount.(14:1) The paucity of funds prevents Doctrine Division from using external research agencies which would greatly save on production time. The use of contractors on more tactical and technical manuals has proven to cut production time as much as one year, though at a cost. For example, the command and control study cost $100,000.(14:1) Often, the savings in time is deemed not worth the savings in money.

Finally, the editorial process suffers from computer hardware and software incompatibilities.(14:1) The word processor programs used by the Marine Corps are not compatible with the civilian editors' programs. The Marine Corps's old hardware does not make fixing the problem any easier.

Thus, one to two years may pass from the time a doctrinal need is identified until a publication is ready for distribution. With the rapid pace of change today, doctrine may be obsolete by the time it is approved. Thus, an unresolvable paradox exists: rapid change dictates the need for rapid production, but a complex environment, dwindling funds, and inadequate numbers of personnel prevent rapid production. Unfortunately, increasing money and personnel

are not options. What options are there?

RECOMMENDATIONS

Doing More with Less

We recommend a three-pronged approach to improving the Marine Corps' ability to produce timely, accurate doctrine: reducing the research and draft burden on Doctrine Division, accelerating adoption of the CDP, and adjusting expectations. Specifics concerning reduction of the research and draft burden are as follows: decentralizing authorship responsibilities, maximizing adoption of other service doctrine, and shifting Doctrine Division's primary role to capstone documents and validation of externally produced documents. These recommendations allow pooling of scarce resources and eliminating duplication, thus maximizing resources. CDP adoption would improve unity of effort. Adjusting expectations provides a reasonable environment to set priorities.

First, appropriate Marine Schools can assume responsibility for tactical or technical type manuals, as schools should be on the cutting edge of innovation within their areas of responsibility and test newly developed equipment. Using schools would require much more interaction between the Marine Corps University and Doctrine Division. The schools would have a conduit for direct input into Marine Corps doctrine. Advanced schools could validate doctrine on a regular basis with each new class. Some of the Marine

Corps' best minds could examine doctrinal quandaries forwarded by Doctrine Division. We do not recommend that students write capstone publications, but that schools' resident talents be exploited to remove part of the research and initial draft burden.

Additionally, another way the Marine Corps can save more time and money is by adopting more Navy and Army doctrine. We already adopt some doctrine, but the area could possibly be exploited more. This is especially true with the establishment of the Naval Doctrine Command and the emphasis on interoperability.

Lastly, we recommend that Doctrine Division act as a central review authority. All doctrine would still go through Doctrine Division for forwarding to the Commandant for approval and accounting purposes. Doctrine Division would produce the capstone documents which provide the foundation for all the supporting doctrinal publications. Decentralizing execution would allow Doctrine Division to focus more on reviewing doctrine, producing the large documents, and coordinating the prioritization of doctrinal needs.

Tying Up Loose Ends

Most importantly, however, the Marine Corps needs to move on with adoption of the Combat Development Process. Completed transition to the process would allow several administrative necessities to occur as follows: allowing development of comprehensive SOP's that define division roles

in the CDP, reviewing personnel and budget requirements, and establishing a knowledge base. Divisions need a blueprint to work from. Personnel realignment and budget reapportionment are vital.

Finally, the Marine Corps needs to realize that everything cannot be a priority and that we have neither the money nor the people to accomplish everything at once. Requirements need prioritization. Currently, Doctrine Division has twenty "priority" projects. This number is beyond their resources. Projects are started that later must sit while new "priorities" take over those resources. Why not sensibly prioritize initially and focus resources and energy accordingly, rather than spreading resources out and diminishing their effects? Scattered effort reemphasizes why a centralized agency controlling priorities is so vital.

Shutting down Marine Schools for a year to write doctrine would only provide a temporary solution. The simple truth is that the Marine Corps is in a period of transition and upheaval. However, the Marine Corps is continuously trying to modify itself without visualizing a true end state and how it plans to get there. The CDP is the right model for action in MCCDC and will produce results. Serious consideration and adoption of our recommendations would produce a lasting solution to a persistent problem. MCCDC may have finally learned "There is never enough time to do it right, but there is always enough time to do it over again."

BIBLIOGRAPHY

1. Carlon, K. C., Col, USMC. "Establishment of the Warfighting Center's Structural Organization." Memorandum, MCCDC. 22 Jan 1988.

2. Daymude, R., LtCol, USMC. Personal Interview, MCCDC. 11 Feb 1993.

3. Del Grosso, C. J., Col, USMC. "MCCDC Integration Issues in Post-Establishment Period: Looking Ahead." MCCDC. 27 Apr 1989.

4. Donovan, J. A., Col, USMC (Ret) "New Concepts and New Doctrine." Marine Corps Gazette, June 1992:42-44.

5. Dutil, R. V., LtCol, USMC "Looking at the Corps in the 'New World Order.'" Marine Corps Gazette, Jan 1992:53-55.

6. General Officers' Doctrinal Symposium: Maneuver From the Sea. MCCDC. 13 Apr 1992.

7. Grubb, D., LtCol, USMC. Personal Interview, MCCDC. 29 Jan 1993.

8. Krulak, Victor H. First to Fight Annapolis: United States Naval Institute Press, 1984.

9. *MAGTF Warfighting Center Standard Operating Procedures.* MCCDC. 18 May 1988.

10. MCBul 5600. "Marine Corps Warfighting Status." MCCDC. 24 Sep 1991.

11. "MCCDC Analysis Study: Final Report." MCCDC. 15 Mar 1990.

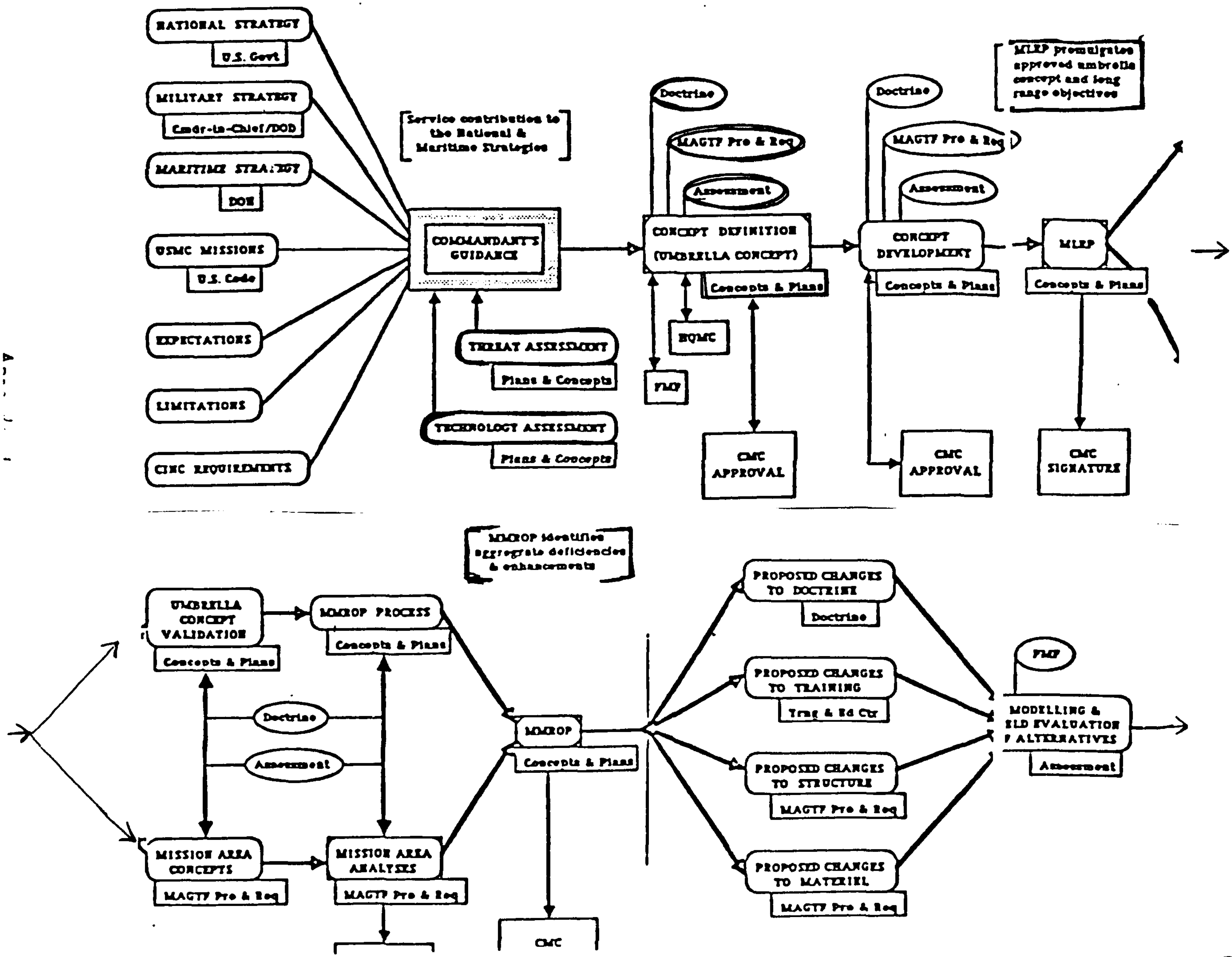
12. MCO 5600.20M. "Marine Corps Warfighting Publication System." MCCDC. 9 Mar 1992.

13. O'Keefe, S. C., SECNAV "...From the Sea: A New Direction for the Naval Services." Marine Corps Gazette, Nov 1992:18-21.

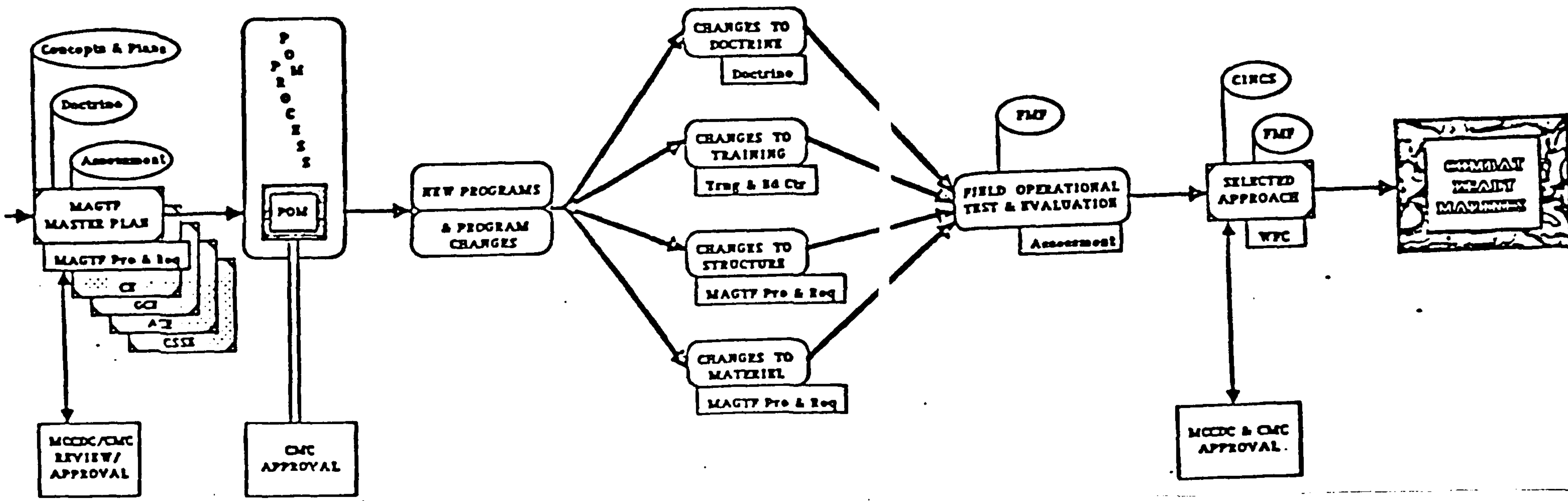
14. Rodgers, C., Maj, USMC. Personal Interview, MCCDC. 4 Feb 1993.

15. United States Marine Corps. *Command and Control, Coordinating Draft FMFM 3.* Nov 1992.

16. Watson, J., Maj, USMC "What's Happening to Our Doctrine?" Marine Corps Gazette, Jan 1993:35-38.



NATIONAL STRATEGY
U.S. Govt
MILITARY STRATEGY
Cmdr-in-Chief/DOD
MARITIME STRATEGY
DON
USMC MISSIONS
U.S. Code
EXPECTATIONS
LIMITATIONS
CINC REQUIREMENTS
Service contribution to the National & Maritime Strategies
COMMANDANT'S GUIDANCE
THREAT ASSESSMENT
Plans & Concepts
TECHNOLOGY ASSESSMENT
Plans & Concepts
Doctrine
MAGTF Pro & Req
Assessment
CONCEPT DEFINITION (UMBRELLA CONCEPT)
Concepts & Plans
HQMC
FMF
CMC APPROVAL
Doctrine
MAGTF Pro & Req
Assessment
CONCEPT DEVELOPMENT
Concepts & Plans
CMC APPROVAL
MLRP promulgates approved umbrella concept and long range objectives
MLRP
Concepts & Plans
CMC SIGNATURE
MMROP identifies aggregate deficiencies & enhancements
UMBRELLA CONCEPT VALIDATION
Concepts & Plans
MMROP PROCESS
Concepts & Plans
Doctrine
Assessment
MISSION AREA CONCEPTS
MAGTF Pro & Req
MISSION AREA ANALYSES
MAGTF Pro & Req
MMROP
Concepts & Plans
CMC
PROPOSED CHANGES TO DOCTRINE
Doctrine
PROPOSED CHANGES TO TRAINING
Trng & Ed Ctr
PROPOSED CHANGES TO STRUCTURE
MAGTF Pro & Req
PROPOSED CHANGES TO MATERIEL
MAGTF Pro & Req
FMF
MODELLING & ELD EVALUATION / ALTERNATIVES
Assessment


Concepts & Plans
Doctrine
Assessment
MAGTF MASTER PLAN
MAGTF Pro & Req
CE
GCE
ACE
CSSE
MCCDC/CMC REVIEW/ APPROVAL
POM PROCESS
POM
CMC APPROVAL
NEW PROGRAMS
& PROGRAM CHANGES
CHANGES TO DOCTRINE
Doctrine
CHANGES TO TRAINING
Trng & Ed Ctr
CHANGES TO STRUCTURE
MAGTF Pro & Req
CHANGES TO MATERIEL
MAGTF Pro & Req
FMF
FIELD OPERATIONAL TEST & EVALUATION
Assessment
CINCS
FMF
SELECTED APPROACH
WFC
MCCDC & CMC APPROVAL.

COMMUNICATION EDUCATION: THE SYSTEMS APPROACH

Submitted to
Major Learn
and Ms. Lloyd-Stanger
at the Communication Officers School
Quantico, Virginia

Captain Daniel J. McGee USMC
Captain Gerald J. Miller USMC
Captain Ronald E. Montgomery USAF
Captain Laura J. Muhlenberg USMC

March 17, 1993

COMMUNICATION EDUCATION: THE SYSTEMS APPROACH

OUTLINE

THESIS: The Operational Communication Chief requires comprehensive knowledge of the integration of tactical communication systems, but the current education system fails to prepare Marines for this critical position. The Marine Corps enlisted communication training pipeline needs to continue transitioning to the Systems Approach to Training (SAT) to adequately prepare communicators for today's complex, systems-oriented battlefield.

I. OccFld 2500 and its current education system

   A. Three basic MOSs comprise OccFld 2500.
   B. Current education systems is series of stovepipes.

II. Problems of the current system

   A. The lack of emphasis on systems first identified at the 1989 conference.
   B. Front End Analysis of OCCFLD 2500 completed June 1992.

III. Corrective action underway

   A. Communication Systems Chief Course began 1991.
   B. Operational Communication Chief Course began 1992.
   C. MCCES instituting Systems Approach to Training and returning to traditional instructor-student forum.

IV. Problems remaining

   A. Lack of training slots at CSCC and OCCC.
   B. No AN/TTC-42s available for training.
   C. OCCC fails to provide adequate training in the joint environment.
   D. There is no screening for selection to attend OCCC.

V. Recommendations

   A. An in-depth screening process is needed to ensure only the best qualified Marines are sent to OCCC.
   B. Adequate funds are needed to rectify shortages in the number of seats and equipment in CSCC and OCCC.
   C. OCCC's curriculum must be refocused to better emphasize joint operations.

VI. Summary

COMMUNICATION EDUCATION: THE SYSTEMS APPROACH

> When dialing 911, a caller in distress has several expectations--that there will be a quick response; that the response will be appropriate and sufficient to meet the crisis;... Similarly, when the Nation faces a crisis, it expects much of the same of its armed forces: that they possess the versatility to respond wherever, whenever and however they are required;... Marines are uniquely qualified to respond to emergency 911 calls, whether in Liberia, Southwest Asia, Bangladesh, the Philippines or Somalia, because they are on-scene, ready and capable.(4:4)

The analogy drawn between the United States Marine Corps and our nation's 911 emergency response network is astonishingly accurate in many respects. This is a particularly cogent comparison with regard to command, control, and communication. Both institutions have highly centralized command and control infrastructures that are dependent on communication. It is ironic that communication is largely taken for granted, but is essential to the successful prosecution of the myriad of assignments the Marine Corps may face today. While technology has continued to evolve unchecked during the last twenty or more years, the Marine Corps has struggled to keep pace with this evolution. One glaring example of the Marine Corps' failure to keep pace with technology is the enlisted communication education system which has remained unchanged for over 20 years.

The operational communication chief, a Gunnery Sergeant, is one of the most critical links in providing communication for the Marine Air Ground Task Force (MAGTF).

His technical expertise must be diverse to facilitate successful connectivity of information systems, the lifeblood of the MAGTF, throughout the theater of operations. The current education system fails to prepare Marines for this critical position by not providing them with comprehensive knowledge of the integration of tactical communication systems. Although the Marine Corps enlisted communication training pipeline has recently made progress in emphasizing the Systems Approach to Training (SAT), it must fully transition to the SAT to adequately prepare its operational communication chiefs for today's complex, systems-oriented battlefield.

Deficiencies in the Marine Corps enlisted training pipeline were first identified in 1989. Since then, many changes to correct these problems have been implemented. To adequately describe the changes to the operational communication field (OccFld 2500) that are either underway or proposed, one must first examine the existing structure of this system to provide a framework for further discussion.

OccFld 2500 CAREER PIPELINE

Marines in OccFld 2500 are responsible for the installation, interconnection, and operation of electronic equipment used to transmit data. They must also perform preventive maintenance on telephone, teletype, switching,

radio, and cryptographic systems that are essential links in command and control operations.

Three major disciplines comprise OccFld 2500: wire, radio, and the communication center. The field wireman is responsible for constructing, operating, and maintaining wire networks that link key outposts, control points, and headquarters with reliable paths for telephone, teletype, facsimile, and digital data messages. The field radio operator's duties include setting up and tuning radio equipment, antennas, and power supplies; establishing contact with other stations; making changes to frequencies or cryptographic codes; and maintaining equipment at the first echelon level. Communication Center Operators work in message and communication centers in the FMF and at bases, posts, and stations. The operators' responsibilities include processing, recording, and typing incoming and outgoing message traffic.(8:3.75)

The enlisted communication training pipeline begins when Marines are assigned Military Occupational Specialty (MOS) 2500 and subsequently sent to the Marine Corps Communication-Electronics School at 29 Palms, California, upon completion of recruit training.

Formal MOS schooling for enlisted communicators begins at one of three basic MOS courses specializing in either wire, radio, or communication center operations. Each Marine emerges from these courses as a field wireman (2512), field radio operator (2531), or communication center

operator (2542), trained exclusively in their MOS. The next formal MOS school that these communicators will attend will be at an intermediate level course either as Staff Sergeants (radio operators and communication center operators) or as Sergeants (field wiremen). Three separate intermediate level schools prepare Marines to serve as chiefs in their respective MOSs; no cross-training occurs at this level. Marines receive one of the following MOSs after completion of an intermediate level course: 2519, wire chief; 2537, radio chief; or 2549, communication center chief. Prerequisites required for the intermediate level communication courses are proficiency, rank as stated above, and two years service remaining. Figure 1 depicts the *OccFld 2500 career* pipeline from entrance as a basic communicator through the most senior enlisted communicator billet. The figure graphically depicts that no cross-training between MOSs occurs until the Marine becomes an operational communication chief as a Gunnery Sergeant.(8:3.87)

The operational communication chief is the senior operational communication noncommissioned officer that directly assists the communication-electronics officer (CEO). He must be knowledgeable about equipment capabilities and system integration of all elements of communication (wire, radio and communication center). His duties include inspecting communication units to determine equipment and operational readiness and supervision of

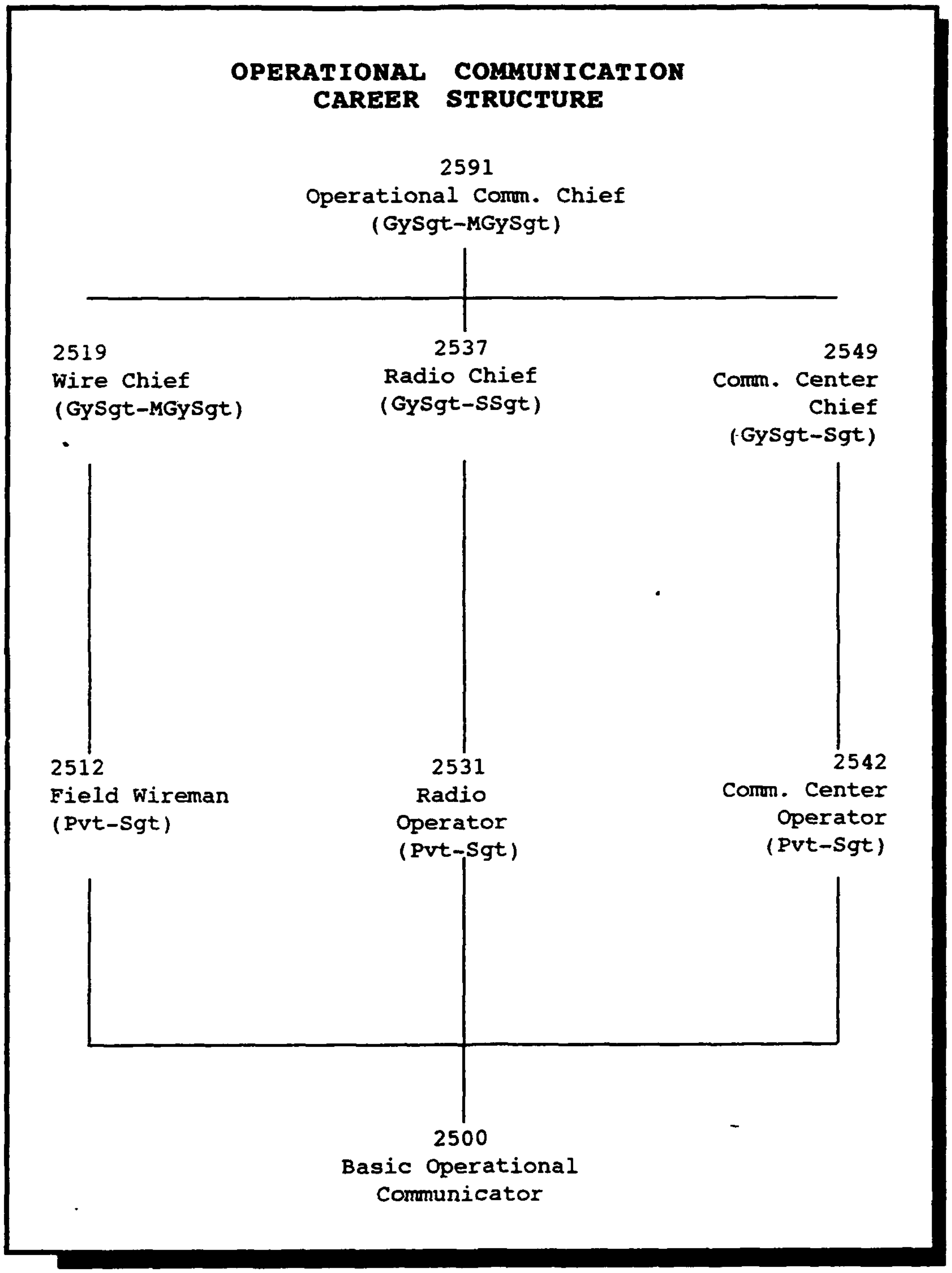


Figure 1: Operational Communication Career Structure Chart

personnel installing, operating, and maintaining wire, radio, and communication center facilities.

The first time cross-training between the three communication MOSs occurs is at the senior level Operational Communication Chief Course. The communication training pipeline is not structured to provide formal instruction in adjacent communication fields prior to the senior level. The assumption is made that Marines will acquire a working knowledge of adjacent MOSs during their careers. That this has proven to be a fallacy is evidenced by the majority of Marines attending OCCC without having sufficient cross-training.(1)

REMOVING THE STOVEPIPES

Operational communication chiefs must attain proficiency in all facets of communication systems to support joint operations and tactics in increasingly larger theaters of operation. The enlisted communication training system still trains its communicators via linear channels commonly known as stovepipes. Communicators trained along stovepipe channels have no lateral cross-training at either the beginning or intermediate level. This system produces communicators who are proficient in their own MOS, but have virtually no knowledge of adjacent systems. At present, the narrow focus in the training pipeline does not provide operational communication chiefs with the broad-based, systems-oriented knowledge they require to establish a

viable communication network for a MAGTF in a large, joint theater.

This deficiency was first identified by senior communicators attending the Senior Communicators Conference in the fall of 1989.(7:1) One recommendation made during this conference was that formal schools at the intermediate (Sergeant and Staff Sergeant) level provide a basic knowledge of adjacent communication MOSs.(7:1)

A Front End Analysis (FEA) of OccFld 2500, dated June 1992, corroborated the need to examine the enlisted communication training pipeline to see if it adequately supported current FMF needs. The FEA supported the recommendation made at the Senior Communicators Conference that Sergeants and Staff Sergeants need to attain basic knowledge of adjacent communication MOSs along with expert knowledge of their own MOS.(5) By learning about adjacent MOSs, intermediate level communicators begin to develop their knowledge of communication systems that will better prepare them to be operational communication chiefs.

Acting on recommendations from the Senior Communicators Conference and the Front End Analysis, the Marine Corps Communications-Electronics School (MCCES) has taken aggressive steps to implement changes that will focus the enlisted training pipeline on systems. Two major changes to the training pipeline are already being implemented: consolidating the three intermediate level courses into a

single systems-oriented course and restructuring the senior level OCCC curriculum to also emphasize systems.

In 1991, the Communication Systems Chief Course (CSCC) replaced the Wire Chief's Course, the Radio Chief's Course, and the Communication Center Chief's Course as a single intermediate level school for Sergeant and Staff Sergeant communicators. CSCC emphasizes the Systems Approach to Training (SAT), which teaches the planning and installation of integrated communication systems, not the specific characteristics for particular pieces of equipment. Incorporating the SAT into training at this level is vital because it begins the cross-training that will prepare communicators to perform as proficient operational communication chiefs.

CSCC is structured around the Individual Training Standards (ITS) for wire, radio, and communication center chiefs. ITSs for all three communication MOSs were incorporated into the curriculum, ensuring that graduates have a solid foundation in each communication discipline. Marines now receive their first exposure to adjacent communication MOSs at the intermediate level school, CSCC. The diversity offered in the CSCC curriculum is depicted in Figure 2.(9:B.1-2)

The purpose of CSCC is to enhance students' expertise in their own field of experience and to expose them to other communication skill areas.(7:1) CSCC is <u>not</u> intended to be a refresher course for Marines who have been out of the

CURRENT CSCC INDIVIDUAL TRAINING STANDARDS

TASK DESCRIPTION	MOS
Plan Mobile Electric Power (MEPG) Support for Communication Operations	2500
Plan Equipment Grounding Procedures	2500
Prepare USMTF And GenAdmin Messages	2500, 2549
Manage MIMMS Documents (LM2/DPR/ERO)	2500, 2519, 2537, 2549
Plan Wire Communications	2519
Plan Route for Field Wire and Cable Laying	2519
Plan a Tactical Switching Network	2519
Plan STU-III Operations	2519
Supervise Communications Security (COMSEC) for a Wire Section	2519
Supervise Maintenance Management Procedures	2500, 2519, 2537, 2549
Plan a Single Channel Radio System	2537
Plan UHF Multi-channel Radio Communication System	2537
Plan SHF Communications	2537
Plan SATCOM	2537
Plan ANDVT Operations	2537
Plan Integration of a Tactical Communication System into DCS	2537
Plan a Tactical Communication/Message Center	2537, 2549
Draft Communication Center Emergency Action Plan (EAP)	2549

Figure 2: Individual Training Standards currently being taught at Communication Systems Chief Course.(9:B.1-2)

communication field. Students attending CSCC should be experts in their own MOS prior to attending so they can concentrate on new concepts such as systems planning and communication systems of adjacent MOSs.

One change that has been instrumental in making SAT effective in the CSCC curriculum is the reinsertion of traditional instructor-to-student classroom instruction. Fixed Mastery/Variable Time (FM/VT), more commonly known as self-paced instruction, has been eliminated. Instructor-to-student interaction facilitates more consistent instruction and a higher degree of student mastery.

These changes have made significant progress, but two problems must be addressed to adequately prepare communicators for today's systems-oriented, joint environment. First, MCCES has no AN/TTC-42s, Unit Level Circuit Switches (ULCS), for practical application training. Because this piece of equipment is at the very heart of MAGTF communications, the total lack of hands-on training creates a significant void in the CSCC curriculum. Secondly, the limited number of course seats available does not train sufficient numbers of intermediate level communication chiefs to adequately support the FMF.

The AN/TTC-42 is the primary telephone switching center that serves as the nerve center for USMC tactical phone systems. Since the ULCS is integral to most MAGTF operations, developing plans utilizing the ULCS and learning

to operate the ULCS are both Individual Training Standards in the CSCC curriculum. However, MCCES does not own or have access to any AN/TTC-42s for hands-on training. Because of the critical role that AN/TTC-42s play in tactical communication, their absence leaves a large gap in the CSCC curriculum.

To rectify this deficiency, practical application training on the AN/TTC-42 must be provided to CSCC students. Ideally, two suites of equipment should be dedicated to MCCES for practical application training. Perhaps more realistic in today's increasingly austere economic climate would be to provide students with computer aided instruction (CAI) on the AN/TTC-42. While less effective than hands-on training, CAI would provide more detailed instruction than is currently available at MCCES. Another advantage to this approach for AN/TTC-42 training is that software for computer aided instruction is already available.

The second major deficiency facing CSCC is a shortage of school seats. Each class is designed to teach a maximum of 40 students per class; 240 students are able to attend CSCC annually.(12:1.2) Approximately 227 intermediate level chiefs attend CSCC each year, but more than 400 chiefs are promoted annually.(2) If the current number of school seats remains constant, over 40% of the Marine Corps intermediate level communication chiefs will not receive systems training at this critical juncture in their careers. To adequately

provide FMF units with chiefs that are knowledgeable in communication systems, more Marines must be permitted to attend CSCC.

To ensure that an acceptable level of intermediate level chiefs are formally trained, 75% of the 400 chiefs promoted annually would need to attend CSCC. An additional 60 seats would be required to train 300 chiefs annually. At an average daily cost of $53.00 per student, per day, these 60 additional seats would cost the school $194,000.00.(6) MCCES has adequate staff and facilities to support this increase now; the only obstacle is money.

PREPARING COMMUNICATION CHIEFS FOR THE FUTURE

The other significant change to the enlisted communication training system being implemented is the restructuring of the Operational Communication Chief Course (OCCC).(1)

OCCC is presented over 84 training days and is convened twice annually. The maximum student capacity is 40 per class according to the Course Descriptive Data; however, the limited availability of training dollars has reduced the average class size to 35 students per class. To attend OCCC, Marines must be a Gunnery Sergeant, Master Sergeant, or Master Gunnery Sergeant within MOSs 2519, 2537, or 2549. No other selection criteria are used to screen students for this course.(8)

The former OCCC curriculum consisted of communication planning, management, and engineering in 15 Individual Training Standards. 328 of 573 total training hours were devoted to communication in amphibious operations, but none were devoted to communication in joint operations. Figure 3 depicts the extremely narrow scope of the former OCCC curriculum that focused almost exclusively on communication in amphibious operations.

Although not officially approved by Headquarters, Marine Corps, the newly restructured OCCC curriculum was first taught in the fall of 1992. The revised course introduced diversity by adding 15 new Individual Training Standards. OCCC does not adequately emphasize joint and systems-oriented concepts, but the incorporation of the systems approach to training reflects the beginning of change. The revised ITS for OCCC, depicted in Figure 4, reflect a much broader curriculum diversity.(6) OCCC is vastly improved over the previous course and makes improvements in preparing communication chiefs to perform efficiently in an increasingly integrated communication and data environment.(9)

Despite the improvements to OCCC, several problems still prevent this course from achieving its optimum effectiveness. Three problems need to be addressed: inadequate course seats, unqualified students attending OCCC, and the lack of emphasis on joint operations and systems integration.

OCCC INDIVIDUAL TRAINING STANDARDS	
LESSON DESCRIPTION	**HOURS**
Draft Plan for Amphibious Communications	328
Draft Unit Communition SOP	5
Recommend Procurement/Allocation of Comm Equip	2
Advise on Location, Echelonment, and Displacement of CP	4
Determine Total Power Requirements for Operations	17
Draft Communications Guard Shift	16
Draft Communication Termination Request and Telecommunication Service Request	24
Conduct Communitions Site Survey	3
Draft a Tactical Switching System Plan	59
Assist Commander and Staff in Comm Planning	15
Plan GMF Communications	24
Perform Systems Planning	18
Direct Communications Control Operations (SYSCON)	8
Coordinate Maintenance Management	34
Coordinate Embarkation of Communication Assets	16
TOTAL ACADEMIC HOURS	**573**

Figure 3: Individual Training Standards currently taught at Operational Communications Chief Course.(8:3)

PROPOSED OCCC INDIVIDUAL TRAINING STANDARDS

LESSON DESCRIPTION	HOURS
Communication Planning	57
Radio Fundamentals	18
Organization/Employment of Comm Assets	17
Digital Communication Terminals	8
Satellite Communications	24
Communications Control (SYSCON/TECHCON)	26
Electronic Warfare	18
Maintenance Management	36
Embarkation	16
Command Vehicles	13
Radio Equipment	36
Power Sources	17
Wire Systems/Procedures (ULCS)	35
Joint Planning Management	12
AN/GRC-201	4
Communications Center Fundamentals	34
Communications Center Equipment	14
Cryptographic Equipment	24
PLRS	8
Computer Literacy	30
Frequency Management	8
Wargames	40
LFTCPAC Communication Planning	40
Electronic Key Management System	8
Date Communications	14
TOTAL ACADEMIC HOURS	**573**

Figure 4: Proposed Individual Training Standards to be taught at the Operational Communications Chief Course.(13:B.1-2)

The first problem facing OCCC is that only 49% of all senior enlisted communicators will be able to attend this senior level course. Currently, only 80 students per year are able to attend OCCC at its maximum capacity. Since the Marine Corps gains approximately 140 new operational communication chiefs each year, this precludes 60 from attending OCCC. To ensure that an acceptable level of operational communication chiefs are formally trained, 75% (105) of the new chiefs would need to attend OCCC. This would require 25 additional seats annually; at an average daily training cost of $53.00 per student, per training day, adding these 25 seats would cost $110,000.00.(6) MCCES has the staff and facilities to adequately support this increase now; money is the only obstacle.

The second issue is the emphasis of the OCCC curriculum. Students spend approximately 82 hours on basic information such as radio fundamentals, communication center fundamentals, and computer literacy. Only 12 hours are allocated for Joint Planning, and no hours are dedicated to TRITAC (joint) communication systems.(10:B.1-2) This emphasis on communication fundamentals reflects that the course is used partially as a refresher course. Marines selected for OCCC should be communication experts that do not need training on rudimentary communication concepts. While OCCC employs the Systems Approach to Training in this course, the curriculum does not substantially emphasize systems. Time devoted to the refresher type courses listed

previously would be used more productively in studying Joint Planning or TRITAC equipment.

The final problem hindering the effectiveness of OCCC is the large number of unqualified students attending the course. Currently, no selection guidance or screening criteria ensures that students are qualified for the course. Many students are incorrectly assigned to OCCC for refresher training after serving in a non-FMF billet. The new curriculum offers a substantial amount of state-of-the-art technical information and focuses on student interaction to promote the optimum learning medium; using this course as a refresher is counterproductive to both the student and the class. To ensure that only the most qualified radio, wire, and *communication center chiefs* fill the limited number of class seats, a formal screening process should be established and centrally managed. A screening checklist with an inventory examination could be sent to assigning commands for completion. Once completed, the checklist/inventory should be returned to MCCES with a command recommendation on the prospective student.(3) MCCES would manage the screening process to ensure only qualified Marines were sent to the school.

MCCES's transition to a Systems Approach to Training, reinstitution of lockstep training, addition of CSCC, and revision of OCCC are impressive steps that will enable the enlisted communication training system to develop more

proficient operational communication chiefs. The enlisted operational communication training system is at a critical juncture. It can either build upon these progressive measures and become one of the most responsive assets in the MAGTF or it can level out in its ascent and simply be another reactive element on the battlefield. The exchange of information is essential to the successful prosecution of any military campaign today and training our personnel to best facilitate this exchange is equally important. Martin Van Crevald summarizes the point well in his book *Command in War*:

> ...victory often depends not so much on having superior technology at hand as on understanding the limits of any given technology, and on finding a way of going around those limitations.

With exceptional lucidity, Dr. Van Crevald articulates the importance of maintaining our edge with proficiently trained personnel. Although the combined cost of increasing the class size of OCCC and CSCC will cost $300,000.00, the return on this investment will be great. Success on the battlefield and lives saved will be the dividends of wise investments made to ensure the Marine Corps has effective and creative communication systems.

As the budget tightens and the theater of operations expands, the Marine Corps will become increasingly involved in joint operations. The Systems Approach to Training that

is being implemented at MCCES emphasizes this type of environment and provides the type of training that our enlisted communication chiefs need. However, SAT is still developing and must continue to evolve. The OCCC curriculum has been positively changed by SAT, but needs more emphasis on joint communication operations for this course to truly be systems-oriented.

A more premeditated selection and assignment policy is needed to ensure that only the most qualified Marines fill the limited number of seats at the Operational Communication Chiefs Course.

We have a prime opportunity now to breathe the life of progressive change back into the communication field in the Marine Corps. The only thing that is certain about communication in maneuver warfare is that it will be uncertain, and it will continue to change. The foundation of any 911 service is instantaneous, efficient communication. If the Marines are to provide this service for the nation, it too must have a sound communication network. This can only happen if our communicators understand how the bigger picture, the systems picture, facilitates an efficient communication network. Our challenge is to train to this new standard and not be shackled by convention.

BIBLIOGRAPHY

1. Allen, Kathryn A., Director, Communication-Electronics Operators School, Marine Corps Communication-Electronics School. Personal interview. 29 Oct. 1992.

2. Cole, Paul L., OCCFLD 25 Task Analyst, TE-31G. Personal interview. 3 Nov. 1992.

3. ---. Personal interview. 15 Jan. 1993.

4. "Dial 911 For Marines: One Call Gets It All." Staff Marine Corps Combat Development Center, Special Projects Office. 21 Jan. 1993.

5. "Front-End Analysis (FEA) Report, OCCFLD 25-Operational Communications." Naval correspondence. 17 Jul. 1992.

6. "Increase OCCC from 77 to 84 Training Days Beginning with OCCC 1-93." Point paper SCTS/CEOS. 29 Oct. 1992.

7. Lawless, J. D. "Course Descriptive Data for the Communication Systems Chief Course." Naval correspondence. 14 Nov. 1991.

8. "Military Occupational Specialities Manual (Short Title: MOS Manual). Marine Corps Order P1200.7L. 1 Apr. 1992.

9. Norton, H. R. "Course Descriptive Data for the Communication Systems Chief Course (CSCC, SSC: 25Q for MOS 2519, 25E for MOS 2537, or 253 for MOS 2549 as appropriate)." Naval correspondence. Undated.

10. ---. "Course Descriptive Data for the Communication Chief Course (OCCC, SCC: 25A, MOS: 2591)." Naval Correspondence. 17 Dec. 1992.

FRIENDLY FIRE: THE PRICE OF WAR

Submitted to
Major Febuary
and Ms. Lloyd-Stanger
at Communication Officers School
Quantico, Virginia

Captain C. H. Gats, USMC
Captain D. K. Lawley, USMC
Captain M. J. Perro, USA
Captain S. J. Wood, USMC

April 8, 1993

FRIENDLY FIRE: THE PRICE OF WAR

OUTLINE

THESIS STATEMENT: Although there are no absolute solutions, the Department of Defense can significantly reduce fratricide by modifying current doctrine and incorporating emerging technologies.

I. **HISTORICAL BACKGROUND**

   A. Addressing the magnitude of friendly fire.
   B. Looking at fratricide statistics from Southwest Asia.

II. **SITUATIONAL AWARENESS**

   A. Examining the shortfalls of situational awareness.
   B. Methods to improve situational awareness.

III. **DOCTRINAL AND PROCEDURAL SHORTFALLS**

   A. Discussion of interservice doctrine.
   B. Performing risk assessments to reduce fratricide.

IV. **TECHNOLOGY AND COMBAT IDENTIFICATION**

   A. Assigning responsibilities to the military services.
   B. Quick-Fix as an interim answer to the fratricide problem.
   C. Quick-Fix Plus addresses friendly fire preventive technology for the next three to five years.
   D. Possible near and far term solutions.

V. **SUMMARY**

Friendly Fire: The Price of War

INTRODUCTION

Solutions to the problem of killing and wounding of friendly forces, better known as fratricide, have been sought since the existence of armed conflict. Although there are no absolute solutions, fratricide can be significantly reduced by modifying current doctrine and incorporating emerging technologies. As long as human beings wage warfare, human error will result in the inadvertent killing of friendly forces. However, as leaders we are obligated to explore avenues that will decrease the number of fratricide victims. During Operation Desert Shield a joint Combat Identification task force was formed in the United States. After much debate and exhaustive study, this task-force decided that developing greater battlefield situational awareness and improved target identification would help reduce the incidence of fratricide. Additional evidence indicates that the friendly fire problem is being attacked on two fronts by Department of Defense (DoD) agencies. First, doctrine and procedures are being evaluated for their relevance on the modern battlefield. Next, technology is being exploited to compensate for the range and lethality of current, state-of-the-art weapons systems.

In order to better understand the importance of developing doctrine, procedures, and technology in combatting the friendly fire problem, we must take an historical look at fratricide.

HISTORICAL BACKGROUND

Friendly fire casualties have been a product of armed conflict since warfare began. Friendly fire incidents have been documented among the armies of antiquity, as well as those of modern times. Yet, the magnitude of the problem is impossible to determine due to the inadequate collection of data through the ages. Commanders, reluctant or unable to report fratricide incidents, may have erroneously omitted statistics from after-action reports and official histories. Dr. Charles R. Schrader, a retired Army lieutenant colonel has studied friendly fire extensivley. He published a study in 1982 when he was a student at the U. S. Army Command and General Staff College. As Dr. Schrader detailed his theory for possible inadequacies in reporting in his 1982 study *Amicicide: The Problem of Friendly Fire in Modern War:*

> The disarray of source materials for the study of amicicide is understandable. The conditions of active combat in which cases of amicicide occur are

scarcely conducive to thorough, accurate reporting of what at the time may seem relatively minor incidents. Furthermore, commanders at various levels may be reluctant to report instances of casualties due to friendly fire either because they are afraid of damaging unit or personal reputations, because they have a misplaced concern for the morale of surviving troops or the benefits and honors due the dead and wounded, or simply because of a desire to avoid unprofitable conflicts with the personnel of supporting or adjacent units. In many cases, of course, the victim's commander may never know that a particular casualty was due to friendly fire. (15:52)

Various sources have produced fratricide casualty estimates for U. S. forces spanning the two World Wars, the Korean War, and the Vietnam War. The number of American fratricide casualties in twentieth century warfare has been estimated to range from just under 2% to about 25% of all service members killed in action (KIA). Regardless of which figure is most accurate, one incontrovertible fact remains-friendly fire has tragic results. Besides reducing combat power, fratricide demoralizes our troops and leaders, and jeopardizes successful mission completion.

U. S. military investigations after Operation Desert

Storm were probably the most thorough and accurate in the history of modern American warfare. In a news release published by the Office of Assistant Secretary of Defense, investigators concluded that 28 friendly fire incidents occurred during the Gulf War. These incidents resulted in 35 of the 148 total KIAs, while friendly fire wounded 72 of the 467 service personnel classified as wounded in action (WIA). The 28 friendly fire incidents investigated are divided into five categories of engagements: ground-to-ground, air-to-ground, ship-to-ship, shore-to-ship and ground-to-air. Ground-to-ground engagements were the most prevalent and the most lethal in terms of killed and wounded. 16 ground-to-ground and air-to-ground engagements resulted in the death of 24 soldiers and Marines. 57 others were wounded in these encounters.

SITUATIONAL AWARENESS

In the "fog of war," engagements must be authorized based not only on a leader's years of experience, but also on the information that is received from subordinates on the front lines. Looking from this perspective a sense of situational awareness must be instilled in all personnel then reinforced through training. Identifying the problems

that cause loss or lack of current situational awareness on the battlefield is the first step. Unfamiliar or unrecognizable terrain is a problem. Not knowing the capabilities and identities of flanking units is another. However, not knowing the future plans of those flanking units is probably the greatest problem of all. Lack of situational awareness can lead to a fratricide incident if any of these problems are left unresolved. To remedy these shortfalls we must do two things: increase situational awareness at all levels and modify our current doctrine, fire control procedures, and rules of engagement to match our maneuver warfare tactics.

To increase situational awareness, leaders must, according to a U. S. Army study, ensure that every member of an organization has "the real-time accurate knowledge of one's own location [and orientation], as well as the locations of other friendly, enemy, neutrals, and noncombatants. This includes the awareness of the of Mission, Enemy, Terrain, Troops and equipment, and Time (METT-T) conditions that impact on the operation." (9:5) All available information must be efficiently and accurately disseminated throughout an organization. Reinforcing learned techniques such as land navigation and fire support planning (direct and indirect) is crucial.

Plans that require movement need to be simple. These

plans also need to tie control measures to easily identifiable terrain features. If navigation aids such as Position Location Reporting System (PLRS) or Global Positioning System (GPS) equipment are used, ensure that personnel are well trained in their use. Basic navigational skills must be maintained in case this equipment fails. Insist on timely reporting and then passing of information, as appropriate, both laterally and up and down the chain of command. Most importantly, all routes, control measures, and fire support plans must be clearly understood by all members of a unit to guarantee situational awareness. By integrating these control measures in all aspects of training, commanders can greatly increase the overall situational awareness within their unit.

DOCTRINAL AND PROCEDURAL SHORTFALLS

Doctrinal and procedural differences that exist between U. S. military forces are significant causes of friendly fire. These problems are caused by service parochialism and lack of joint training. For example, differences in operational syntax continue to plague communications throughout the services in spite of distribution of Joint Chiefs of Staff Publication 1, which

created a uniform operational terminology. Another example is lack of inter-service doctrine combined with general unfamiliarity between services. This is likely to be the single largest contributor to our inadequate fire control measures. Existing fire control measures and rules of engagement have not been modified to keep pace with the capabilities inherent in our current weapons systems or our warfare tactics.

Changing our doctrine to match our current organization for combat, weapons systems, and tactics is necessary if we want to reduce fratricide. If we intend to fight in a joint or combined forces environment, liaison teams with trained linguists are a must. These liaison teams should also include operators representing all supporting arms. The staff of any joint/combined task force commander needs to have an organic subsection or directorate that has the overall responsibility for supporting arms planning and coordination within the task force. This subsection would further solidify the lines of communication between the ground combat and air combat components of the task force; it would be similar to the Force Fires Coordination Center utilized by I MEF in Operation Desert Shield/Desert Storm.

Current tactics and rules of engagement must conform to the weapons systems' target recognition capabilities

under both optimal and degraded conditions. Modern weapon systems can engage targets at distances beyond the onboard target identification systems. Until improvements are made to the thermal sights on many weapons systems, new engagement criteria needs to be established. By fine tuning our rules of engagement we can reduce the threat of fratricide and not detract from our ability to provide decisive fires at a given time and place. Positive identification of targets or potential targets prior to engagement is essential to curb occurrences of fratricide.

To address these same problems, the Department of the Army has instituted a fratricide risk assessment program to help commanders identify the fratricide risk inherent in a particular operation or exercise. This program stresses that the level of potential for fratricide can be ascertained by reviewing various aspects at certain phases of an operation. This allows the commander to make the operation as safe as possible without compromising the integrity of the mission. Commanders should use the factors depicted in Figure (1) as a basis for identifying potential problem areas.

It should be noted that these areas are only starting points from which to begin a fratricide risk assessment. Any factors that are unique to a given situation should also considered. Procedures can be developed with

PLANNING PHASE

Clarity of enemy intent.

Clarity of friendly intent.

Clarity of commander's intent.

Complexity of operations.

Rules of engagement.

Allocation of subordinate planning time.

PREPARATION PHASE

Rehearsals.

Training\proficiency of unit.

Relationship between participating units.

Endurance of unit.

EXECUTION PHASE

Intervisibility between units.

Battlefield obscuration.

Target acquisition vs target identification.

Friendly and enemy equipment similarities and dissimilartities.

Vehicular density of battlefield.

Tempo of battle.

FIGURE (1)

fratricide prevention already taken into consideration in both the deliberate and hasty planning phases. This process is accomplished in two stepsduring planning. The first step is analyzing the individual factors' effects for potential to contribute to or precipitate into a friendly fire incident. The next step is comparing these factors to the METT-T, troop leading procedures, and courses of action. This process will carry over into preparation and execution phases through supervision by the commander, his staff, and the subordinate commanders. The entire process is illustrated in Figure (2). (9:B-2)

FRATRICIDE Risk Reduction Measures	Routine Measures Low Risk	Caution	Extraordinary Measures High Risk
• FIRE AND MANEUVER CONTROL	Brief Backs Supervision PMCS & Pre Combat Checks	Lim Vis Rehearsal Reinforce Clear Intent Cross-Level/Consolidate Equip	Converging/Adj Forces Rehearsal Task Force Rehearsal
• FIRE DISTRIBUTION PLAN	Extensive Rehearsals SOPs Synchronization Matrix	Modify Task Organization Some Direct Fire Units-Wpns Hold or Tight Limited Visibility Plan	Multiple Synchronization Rehearsals Modify Plan Limited Objectives
• LAND NAVIGATION	Detailed Navigation Plan Reconnaissance Confirms Impact of Terrain-Weather-Enemy	Ground Guides/Night Vision Aids Redundant Navigation Aids Marking Enemy Positions	Multi-Echelon Navigation Extensive Recon/Centralization Reduce Equipment Dependence
• FIRE CONTROL AND BATTLE TRACKING	Positive Clearance of Fires Commo Checks Fire Support Rehearsal	Positive Clearance of Fires Restrictive Control Measures SOP Guides/Beacons/Vectoring	POSITIVE Clearance of Fires More Leaders Forward Redundant Commo Provide Backups
• BATTLEFIELD HAZARDS	Safety Discipline Disseminate Known Hazards	Vehicle Hazards Considered Rehearse React to Hazard Review Equip Limitations	Add Intermediate Objectives Special Log/Maint Actions Detailed Deception
• COMBAT IDENTIFICATION	Sustain CVI Skills Boresight Cbt Vehicle Recognition Sys	CBT ID Enhancements IFF Expedients for Exposed Elements	Clear IR Friendly Marking Multiple Recognition Signals
• FIRE CONTROL DISCIPLINE	Review ROE Challenge/Password Discipline Inspections Buddy System	Lighten Load/Review Equip List Simplified Plan Simplicity/Repetition Modify ROE	Interim Halts/Assessments Challenge/Password Enhancements Rotate High Stress Positions
• SOLDIER AND LEADER PREPAREDNESS	Address Seasonal Hazards Sustainment Training Sustain Morale Full Troop Leading Process Sleep Plan	Max Use of Transport Abbreviated Troop Leading Process Refresh Mission Specific Skills Controlled Pace in Execution	Priority of T[illegible] Priority [illegible]hearsals FRAGO only for Efficiency Request Additional Combat Power Don't Exceed Tng Proficiency

FIGURE (2)

FRATRICIDE Risk Reduction Measures	Routine Measures Low Risk	Caution	Extraordinary Measures High Risk
• FIRE AND MANEUVER CONTROL	Brief Backs Supervision PMCS & Pre Combat Checks	Lim Vis Rehearsal Reinforce Clear Intent Cross-Level/Consolidate Equip	Converging/Adj Forces Rehearsal Task Force Rehearsal
• FIRE DISTRIBUTION PLAN	Extensive Rehearsals SOPs Synchronization Matrix	Modify Task Organization Some Direct Fire Units-Wpns Hold or Tight Limited Visibility Plan	Multiple Synchronization Rehearsals Modify Plan Limited Objectives
• LAND NAVIGATION	Detailed Navigation Plan Reconnaissance Confirms Impact of Terrain-Weather-Enemy	Ground Guides/Night Vision Aids Redundant Navigation Aids Marking Enemy Positions	Multi-Echelon Navigation Extensive Recon/Centralization Reduce Equipment Dependence
• FIRE CONTROL AND BATTLE TRACKING	Positive Clearance of Fires Commo Checks Fire Support Rehearsal	Positive Clearance of Fires Restrictive Control Measures SOP Guides/Beacons/Vectoring	POSITIVE Clearance of Fires More Leaders Forward Redundant Commo Provide Backups
• BATTLEFIELD HAZARDS	Safety Discipline Disseminate Known Hazards	Vehicle Hazards Considered Rehearse React to Hazard Review Equip Limitations	Add Intermediate Objectives Special Log/Maint Actions Detailed Deception
• COMBAT IDENTIFICATION	Sustain CVI Skills Boresight Cbt Vehicle Recognition Sys	CBT ID Enhancements IFF Expedients for Exposed Elements	Clear IR Friendly Marking Multiple Recognition Signals
• FIRE CONTROL DISCIPLINE	Review ROE Challenge/Password Discipline Inspections Buddy System	Lighten Load/Review Equip List Simplified Plan Simplicity/Repetition Modify ROE	Interim Halts/Assessments Challenge/Password Enhancements Rotate High Stress Positions
• SOLDIER AND LEADER PREPAREDNESS	Address Seasonal Hazards Sustainment Training Sustain Morale Full Troop Leading Process Sleep Plan	Max Use of Transport Abbreviated Troop Leading Process Refresh Mission Specific Skills Controlled Pace in Execution	Priority of Tasks Priority of Rehearsals FRAGO only for Efficiency Request Additional Combat Power Don't Exceed Tng Proficiency

FIGURE (2)

TECHNOLOGY AND COMBAT IDENTIFICATION

The Department of Defense is looking to industry and its advancing technology in an effort to reduce fratricide. As previously mentioned, the increased range and standoff engagement distance of new weapons systems further complicate the friendly fire problem. To improve this situation, industry must address the shortcomings in combat target identification and the need for an improved system for enhancing battlefield situational awareness. If these obstacles can be overcome, improvements in doctrine, training, and management of the new systems should greatly reduce the loss of personnel and assets to friendly fire. In attacking this problem, the Navy is preparing the Joint Management Plan and the Joint Master Plan regarding the fratricide issue. The Navy is leading the effort in Cooperative Aircraft Identification, Air-to-Air, and Ship-to-Ship anti-fratricide research. A Congressional report published October 5, 1992 states:

> The conferees agree with House language which directs the Army to take the lead for ground combat identification. In addition, the conferees direct that the Army develop ground IFF (Identification-Friend or Foe) systems for the Marine Corps. The Marine Corps is directed to

assign a senior officer to the Army program office to make sure that Marine Corps' interests are represented. (1)

The Army is the lead department for developing Air-to-Ground, Forward Anti-Air Defense Combined Arms, and Ground-to-Ground anti-fratricide methods. The Army's role as initiator is driven by the size of the service and the direct topical correlation to the other services. A task force comprised of elements from the Army's Training Command and Material Development Command has identified near, mid-term, and long-term solutions that approach the topic as either a situational awareness problem or an inability to adequately identify the targets.

The Marine Corps is also working with the Army in an effort to find solutions to these problems. Operation Desert Shield/Desert Storm, with its great potential for inordinately high percentages of friendly fire casualties, forced the Army to begin looking even harder for solutions to the fratricide problem. The Army established an Office of Combat Identification Technologies (OCIT) to develop solutions. Working with the Marine Corps and the Air Force, the OCIT was able to identify, develop, test, and field BUDD lights, DARPA lights, and thermal tape. All were used by units in Southwest Asia, although thermal tape had already been used by U. S. Army Rangers during night

raids in Panama.

In the aftermath of the Gulf War, The Army Vice Chief of Staff stated, "[the Army] cannot accept casualties that can be prevented by our own actions to improve combat identification." A March 1991 Army Acquisition Executive memorandum tasked the Army to develop possible solutions to the fratricide problem. The Army's Training and Doctrine Command and Army Material Command were assigned to find proposed solutions in the areas of doctrine, training, leader development, organization, material, and advanced technologies to interface with other services and allies.

Working groups first tried to determine the causes of friendly fire incidents. In his 1982 study, Dr. Schrader determined that friendly fire was caused by the following factors: coordination problems (45%), poor target identification (26%), inexperienced troops (19%), while the causes of the remaining 10% of incidents are unknown. A subsequent study performed by the Rand Arroyo Center in 1986 suggests three general factors contribute to direct fire fratricide: unknown location of friendly vehicles or units, intermixing of friendly and enemy vehicles on the battlefield, and misidentifying targets. These two studies highlight the battlefield target identification problem. Target misidentification, along with disorientation of the attacking unit on the battlefield; poor unit location

reporting and tracking at all levels; and misinterpretation or limited understanding of the meaning, employment, and restrictions associated with specific control measures are the primary causes of fratricide.

During October 1991 OCIT asked a group of retired general officers how fratricide can be prevented. These officers broke the problem down into two areas: situational awareness and target identification (TI). In contrast to situational awareness, target identification is defined as accurate, dependable, through-sight discrimination between friend and foe. A positive identification capability out to the maximum range of weapon and target acquisition systems is necessary. The positive identification technique or capability should result in no increase in friendly vulnerability or degradation of systems' performance.

Current systems of identification and identification training are being improved. The Army has developed a standardized vehicle marking system. Additionally, simulator graphics and training devices are undergoing improvements that will teach our soldiers and Marines to rapidly identify enemy and friendly vehicles in all types of conditions. The identification issue is a particular concern in the era of small wars we are entering where the opposition may operate NATO-type equipment and our allies

may have Warsaw Pact equipment. The DoD developed a time line to better define service expectations for the development and fielding of equipment. The time line has been broken down into the following phases: Quick Fix, Quick Fix Plus, Near Term solutions, and Mid/Far Term solutions.

Equipment that falls into the Quick Fix category is already available and in the military inventory. An example is the VS-17 panel, a bright orange cloth used for marking landing zones. A group of these panels can be seen through optical sights from the air at a distance of eight to ten kilometers. During Desert Shield/Desert Storm, VS-17s were put on top of vehicles to identify them as friendly. Another item already in the supply system is the chemical light. Chem Lights, as they are known, are brightly colored and glow in the dark. They are used for visual identification at short ranges, usually no more than two kilometers by the unaided eye or night vision goggles. The simplest, yet least effective Quick Fix method was to paint an inverted "V" on the side, front, back, and tops of vehicles. This method was only effective during periods of good visibility.

Since these measures proved ineffective, the services jointly developed devices which could be shipped overseas in immediate support of Desert Shield/Desert Storm. The

first item developed was the BUDD light. This piece of equipment is a flashing light in the near infrared light spectrum that can be seen through night vision goggles, making possible identification of friendly forces at approximately six to eight kilometers. The next development was the DARPA light, which also requires the use of night vision goggles, allowing identification at a distance of six to eight kilometers. It was primarily designed to prevent air-to-ground target misidentification. The DARPA projects a cone of infrared light visible to spotters or forward air controllers, allowing rapid identification of vehicles as friendly. Another Quick Fix item available was thermal tape. Thermal tape could be seen by equipment operating in the far infrared spectrum of light at a distance of two Km. This tape appears cold against the hot background of a vehicle that is, or has recently been, running (thus having a warm engine). Thermal tape patterns on vehicles allow friendly forces to be identified by aircraft equipped with Forward Looking Infrared (FLIR) devices or ground equipment with thermal imagers in their sights.

The last Quick Fix solution was the employment of GPS. The GPS receiver is a very important tool. It tells users precisely where they are with relation to the battlefield. GPS uses two or more geosynchronous satellites and

preprogrammed triangulation formulas to determine a user's position. This solution was especially useful in the controlling of indirect fires, as observers and firing agencies could precisely identify their locations. The use of GPS resulted in a more effective target engagement.

While these Quick-Fix solutions are improvements, they are interim at best. All but the GPS are easily exploited by a fairly unsophisticated threat. These solutions are simply short term options that can be obtained and employed by commanders.

Detailed operational requirements for future equipment have been distributed to the defense contractors via the acquisition departments of the lead services. The systems are required to be passive, non-cooperative, and non-exploitable. They will have to be operational in all weather and in limited visibility conditions. At the same time, they must be compatible with technologies used on current weapons and sensor platforms. These systems will be used by all types of combat units to positively identify friendly forces. Currently, several companies are developing systems which conceptually prevent fratricide. Many have been reviewed and several accepted for further research and development.

Systems capable of meeting these requirements will not be developed as soon as they may be needed. Therefore,

Quick Fix Plus solutions are currently being tested for fielding. GPS will be integrated, as one of these solutions, into Abrams tanks, Bradley Fighting Vehicles (BFV), and High Mobility Multi-purpose Wheeled Vehicles (HMMWV). GPS will improve the situational awareness of the vehicle commander. Also identified as a Quick Fix Plus solution is the installation of GPS equipment into other tactical vehicles. This on-board equipment will allow operators to know exactly what direction they are traveling. A thermal beacon is being developed in the Army's Night Vision Laboratory at Fort Belvoir. This device is a rotating beacon that will display a hot and cold signal only visible to a FLIR system, identifying the vehicle as friendly.

The solutions to the situational awareness and target identification problems contain many implied hurdles and additional subsystem requirements. How will information be transferred to the people that need it on a real-time basis? How will this information be retrieved or pulled by the user so that he or she is not overwhelmed with useless data? Will there be a need for a new type of information management, one capable of rapidly managing the chaos on a fluid battlefield?

Industry has been working on several methods to provide the "trigger puller," with methods of interrogating

possible targets in order to identify them as friend or foe. Currently, the most promising developments are the long-term integrated systems of intelligence and position locating that can provide everyone with an real-time battlefield display. A combination of an imbedded interrogation system using radio signalling and PLRS are technological possibilities that must be implemented to reduce fratricide during the next armed conflict.

In conjunction with these innovations, information need lines must be identified. The design of a network capable of rapid exchange of information across several subsystems and different protocols is essential. A slow or inadequate system will do more harm than good by delaying engagement time and by reporting old position locations.

Today the Army is looking into a friendly positioning system and an intelligence analysis system. Both require a network and a full time information management structure. (Full time information management structures are currently not available.) The first system is an integration of GPS with PLRS. This provides a controlling unit, a shelter-mounted computer processor which displays the location of all subscribers in the net. Each subscriber may function as a relay for all other subscribers and may also function as a way point in determining the position of others in the net. Through a process based on a polled update and signal

transmission time, positions of the transmitter are calculated by the controlling unit through triangulation from all other receivers. Each receiver is polled two or three times a minute based on the need for update. The polling update is performed via a digital VHF radio signal that contains information about the unit location and the times it received the unit's last polling transmission time. PLRS proved to be very effective during the conflict in the Persian Gulf. Now tactical system planners need to incorporate all "slugger" users into the system and then integrate it with current weapons control systems. Once this is done, the information held by the PLRS controller will be shared with the aviation and field artillery communities, which will reduce the probability of friendly fire casualities.

The second system being developed can also reduce friendly fire casualities. It is based on an intelligence analysis system. Situational awareness will be enhanced through the integration of enemy location overlays. This overlay will be provided via an intelligence system being developed by the Marine Corps and the Hughes Corporation. The Intelligence Analysis System (IAS) is a UNIX-based system which provides multi-source intelligence support to combat operations.

Enemy overlays depict aggressor positions. PLRS

provides locations of friendly forces. Therefore, commanders can position friendly units in reference to the hostile locations. The difficulty remains with the transfer of information on a timely basis to the "trigger pullers." In the future, capabilities to network information will be enhanced when both the IAS and the PLRS systems are based on Sun Workstations.

These new networked technologies will require trained nonprogramming end-users. From unit-based workstations, command level users will use pre-written software to plot friendly and enemy locations on one map overlay. Menu driven communication applications will disseminate the information. The task of the network control will be a large undertaking. Because this information will be time sensitive, it must be distributed to the user on the battlefield quickly.

These systems' architecture needs to be open. This architecture must allow for communication within several interactive systems, such as local or wide area networks. The complexity of the files and interface as well as the need for rapid responsivenes will also drive the design of the network and communication architecture.

SUMMARY

Current doctrine and procedures, with the modifications indicated, should prove adequate in the near term, as long as all services and their leaders conform to joint doctrine. The greatest challenges lie in improving the situational awareness of all present on the battlefield and enhancing battlefield target identification.

Situational awareness reduces the potential for friendly fire by providing real-time, accurate knowledge of one's relative position in relation to other friendly locations, danger areas, enemy locations, and noncombatants. Ensuring positive target identification reduces the probability of fratricide by discriminating between friend and foe. There is an immediate need to incorporate the technological innovations being delivered by industry with doctrine, training, and procedural and technical management. Management of the advancements will require a phased approach of improving existing equipment, from selective replacement with off-the-shelf technologies to implementation of an integrated system replacement. Technology is certainly not the sole answer; the human dimension must be considered as well. Certainly the tragic and unnecessary loss of life resulting from friendly fire demands that this problem be addressed before Americans and

their allies find themselves involved in the next armed conflict.

BIBLIOGRAPHY

1. Appropriations Committee Subcommittee Report, *Making Appropriations For The Department Of Defense for The Fiscal Year Ending September 30, 1993*, United States House of Representatives.

2. Chudoba, Capt, Personal Interview, 08 Dec. 1992.

3. *Combat Identification*, Quantico: Amphibious Warfare Technology Directorate, 1992.

4. *Combat Identification for the Dismounted Soldier*, Fort Monmouth: Combat Identification Systems Program Office, Aug. 1992.

5. *Combat Identification Program*, Fort Monmouth: Combat Identification Systems Program Office, July 1992.

6. *Combat Program Interim Report*, U. S. Army Training and Doctrine Command, Fort Monroe Va. 12 Dec. 1991.

7. van Creveld, Martin, Course Lecture, Command and Control Systems Course, Communications Officer School, Quantico Va, 12 Jan. 1993.

8. *Fratricide Awareness and Prevention*, U. S. Army Combined Arms Command, Fort Leavenworth, 1992.

9. *Fratricide Risk Assessment For Company Leadership*, U. S. Army Combined Arms Command, Fort Leavenworth, 1992.

10. Harrison, MGen. and Clark, MGen., Public Affairs Brief on Combat Identification, Fort Monroe, Va. 12 Dec. 1991.

11. *Military Probes Friendly Fire Incidents*, Washington: Offices of Assistant Secretary of Defense 13 Aug. 1991.

12. *Near Term Battlefield Combat Identification System Cost and Operational Effectiveness Analysis (COEA) Study Plan*, Fort Monroe, Va.: U. S. Army Training and Doctrine Command, Fort Monroe Va. 1992.

13. Potter, LtCol., Personal Interview, 18 Nov. 1992.

14. Schrader, Charles R. "Friendly Fire: The Inevitable Price," *Parameters*, Autumn 92: p. 29-43.

15. Schrader, Charles R. *Amicicide: The Problem of Friendly Fire In Modern War*, U. S. Army Command and Staff College, Fort Leavenworth, Kansas 1982, p. 52

16. Stroud, Robert, Personal Interview, 22 Feb. 1993

A SUCCESS IN JOINT DOCTRINE: MARINE COMBAT AIR IN THE JOINT ENVIRONMENT

Submitted to
Major Learn
and Mrs. Sandra Kirkpatrick
at the Communications Officers School
Quantico, Virginia

Captain B. J. Brown USA
Captain J. E. Devers USMC
Captain S. H. Kay USMC
Captain J. K. Smith USAF

8 April 1993

A SUCCESS IN JOINT DOCTRINE:
MARINE COMBAT AIR IN THE JOINT ENVIRONMENT

Thesis: Although great strides have been made to coordinate aviation assets in a joint environment, differences in service doctrine must be resolved and joint doctrine must be amended to ensure that the combat effectiveness of service organizations is not degraded.

I. Introduction

II. The Marine Corps' Perspective

A. Marine aviation as integral component of MAGTF

B. Focus on tactical level of war

C. Centralized command/decentralized control of aviation

III. The Air Force's Perspective

A. Theater level coordination of aviation assets

B. Focus on strategic and operational level of war

C. Centralized command/centralized control of aviation

IV. The JFACC: The Problem and the Solution

A. Need to coordinate aviation assets in theater

B. Need to preserve service doctrine

C. Need to preserve integrity of MAGTF

D. Need for equal representation on JFACC staff

V. Functional Componency versus Service Componency

A. Functional organization for war

B. Service organization for war

VI. Conclusion

A SUCCESS IN JOINT DOCTRINE:
MARINE COMBAT AIR IN THE JOINT ENVIRONMENT

INTRODUCTION

One of the most frequently used terms within the Department of Defense today is "jointness." The Army, Air Force, Navy and Marine Corps are all striving to become interoperable and tailor their service-specific doctrines to be compatible with joint doctrine. In this era of defense cutbacks, joint operations will be conducted more frequently to maximize the capabilities of each of the services. The mandate from Congress that all services eliminate needless redundancy in both mission capabilities and equipment will make joint operations even more necessary in the future. Since all branches of the military may lose some of their capabilities, the services will need to better complement each other to field an effective, cohesive national defense.

The recent emphasis on joint operations began in 1986 when Congress enacted the Goldwater-Nichols Act to enhance the effectiveness of joint organizations and reduce the duplication of effort by the services. One of the results of the Goldwater-Nichols Act was the adoption of the Omnibus Agreement to address control of Marine aviation in joint operations. Since the signing of the Omnibus Agreement in 1986, there has been

significant progress in ensuring that Marine aviation is effectively employed to support joint operations without degrading support to Marine Air-Ground Task Forces. The Omnibus Agreement addressed operational control of theater aviation assets as it pertains to the Joint Forces Commander (JFC), the Joint Forces Air Component Commander (JFACC), and the various service component commanders. Although great strides have been made to coordinate aviation assets in a joint environment, differences in service doctrine must be resolved and joint doctrine must be amended to ensure that the combat effectiveness of service organizations is not degraded.

THE MARINE CORPS' PERSPECTIVE

Control of Marine Aviation in a joint environment is not a new issue. Since World War II, the services have disagreed about how aviation assets should be integrated with ground forces to best influence the battlefield. The debate has been whether aviation is best employed under direct control of the battlefield commander or under the control of a central commander responsible for all aviation assets within the theater of operation. The history of the MAGTF and Marine aviation is replete with examples of Marine aviation being incorporated into a regional air force and not maintained as an integral component of the MAGTF.

During the island-hopping campaign in the South Pacific during World War II, the Chance-Vought F4U Corsair was unsuitable for carrier service and was therefore integrated into the Navy's land-based aviation force. All land-based aircraft in the South Pacific from all services were placed under the Commander, Aircraft South Pacific (ComAirSoPac), Rear Admiral John S. McCain. In all but four battles in the campaign, land-based aviation was relegated to the missions of interdicting supply lines, bombing air bases, and maintaining air superiority. Aviation elements could only support ground forces in battles where airfields were available in close proximity to the ground war. During the battle of Okinawa, Major General Francis P. Mulcahy, CG 10th Army's Tactical Air Force (TAF), fulfilled the role of JFACC. Under his command, Marine aviation finally flew support missions in direct support of Marine ground units. This marked the first instance of Marine aviation supporting Marine ground units in sustained operations ashore under the command of a JFACC. Throughout Marine aviation history, the question has remained: Who should control Marine aviation assets?

Likewise, during the Korean War and the Vietnam Conflict, the preponderance of Marine aviation flew under the control of a theater-level air force. The integration of Marine aviation with other air units did not mean that Marine air was not available to support Marine ground units. The judicious use of Marine liaison officers on the air planning staffs ensured that air assets were

available to support Marine ground units when required. (2: 53) However, until the Omnibus Agreement, there was no formal agreement between the services confirming what had been carried out in practice during previous conflicts. The Omnibus Agreement states that:

> The Marine Air-Ground Task Force (MAGTF) commander will retain operational control of his organic air assets. The *primary* mission of the MAGTF air combat element is the support of the MAGTF ground element. During joint operations, the MAGTF air assets will *normally* be in support of the MAGTF mission. The MAGTF commander will make sorties available to the Joint Force Commander, for tasking through his Air Component Commander, for air defense, long-range interdiction, and long-range reconnaissance. Sorties in excess of MAGTF direct support requirements will be provided to the Joint Force Commander for tasking through the Air Component Commander for the support of other components of the joint force as a whole.
>
> Nothing herein shall infringe on the authority of the Theater or Joint Force Commander, in the exercise of operational control, to assign missions, redirect efforts (e.g., the reapportionment and/or reallocation of any Marine tacair sorties when it has been determined by the Joint Force Commander that they are required for higher priority missions), and direct coordination among his subordinate commanders to insure unity of effort in accomplishment of his overall mission, or to maintain integrity of the force, as prescribed in *JCS Pub 0-2, Unified Action Armed Forces.*[*] *(UNAAF)*

The Omnibus Agreement acknowledges that Marine aviation is an integral component of the MAGTF, but when necessary, it can assist in supporting the deep battle as an integral component of the aviation assets available in a theater of operations.

---

[*]Italics added for emphasis.

THE AIR FORCE'S PERSPECTIVE

Following World War II, the National Security Act of 1947 elevated the Army Air Corps to the status of a separate service under the Department of Air Force, yet the debate over control of aviation assets still exists. Long after the restructuring of the Department of Defense, the Air Force and the Marine Corps continue to disagree over the basic concept of control of Marine tactical aviation resources in joint land combat operations. The principal tenets of Air Force doctrine include the concept of centralized command, centralized control, and decentralized execution. (3: 34) As a result of this doctrine, all planning within a theater of operation is conducted by a central planning group which allocates sorties of aircraft to specific missions. This contradicts the Marine Corps doctrine which emphasizes centralized command, decentralized control, and decentralized execution. The Air Force doctrine was developed to support a strategic air campaign, which is primarily focused on the maintenance of air superiority and the destruction of strategic targets. The Marine Corps doctrine, on the other hand, was developed to provide flexible aviation support to ground units in a dynamic environment.

The Air Force maintains that, when operating in a joint

environment, all aviation assets should be integrated under the JFACC to ensure that aviation resources are allocated to support the JFC's overall mission and plan. The Air Force interpreted the Omnibus Agreement to mean the JFACC would be delegated operational control of all theater aviation assets by the Joint Forces Commander, to include Marine aviation. (6: 3-4) The Air Force's rationale was derived from *JCS Pub 1-02* which states:

> The Joint Force Air Component Commander derives his authority from the Joint Force Commander who has the authority to exercise operational control, assign missions, direct coordination among his subordinate commanders, redirect and organize his forces to ensure unity of effort in the accomplishment of his overall mission. The Joint Force Commander will *normally* designate a Joint Force Air Component Commander. The Joint Force Air Component Commander's responsibilities will be assigned by the Joint Force Commander (normally these would include but not be limited to, planning, coordination, allocation and tasking based on the Joint Force Commander's apportionment decision). Using the Joint Force Commander's guidance and authority, and in coordination with the other service component commanders and other assigned or supporting commanders, the Joint Force Air Component Commander will *recommend* to the Joint Force Commander apportionment of air sorties to various missions or geographic areas.[2]

This excerpt from *JCS Pub 1-02* is open to interpretation and lacks specificity in the sense that the Joint Forces Commander *may* delegate any amount of responsibility or authority to the JFACC that he deems appropriate. The Marine Corps' concern is that a Joint Force Commander may delegate to the JFACC so much authority that the JFACC would have operational control of Marine

---

[2]Italics added for emphasis.

combat aviation. This delegation of authority would pose a potential threat to the combined arms doctrine of the MAGTF and diminish the MAGTF's war-fighting capability.

Although the Air Force is usually associated with the JFACC, other services may function as the JFACC in joint operations. Generally speaking, the service component commander with the preponderance of air assets in the theater of operations will be designated as the JFACC. Since the Air Force usually has the preponderance of aviation assets in a joint environment, the Air Force service component commander is usually designated as the JFACC. The Joint Forces Commander, however, is not precluded from assigning the Navy or Marine Corps as the JFACC, nor is he precluded from doing without a JFACC if the situation does not require one.

THE JFACC: THE PROBLEM AND THE SOLUTION

Currently the Air Force and the Marine Corps agree, in general, with the provisions of the Omnibus Agreement, but the method of implementing the agreement has yet to be resolved. The disagreement pertaining to the operational control of Marine combat air predates Operation DESERT SHIELD/DESERT STORM. During that engagement, other areas of contention arose. The issues were not a matter of whether or not Marine aviation should be

integrated into the air campaign, but rather *how* Marine aviation would be integrated into theater planning and *how* joint planning should be conducted. (7: 59)

The Air Force and Marine Corps agree with the role of the JFACC as outlined in the Omnibus Agreement and *JCS Pub 1-02*. Agreement exists on general issues such as the concept of a JFACC and the need for centralized coordination of aviation assets to facilitate unity of effort. However, the unity of effort philosophy causes confusion between the Air Force and Marine Corps. While both services agree on the importance of unity of effort, the Air Force views it as being synonymous with unity of command. (3: 34) The Marine Corps promotes the ideology of unity of effort, but believes unity of effort is best achieved through decentralized control.

The Air Force views air operations from a theater perspective holding unity of command as a basic tenet of Air Force doctrine. By centralizing the management of all air assets, the Air Force feels the preponderance of air power can be brought to bear at the critical time and place within the theater of operations. Centralized control and decentralized execution are fundamental elements of Air Force operational doctrine. On the other hand, the Marine Corps' primary concern is the support of MAGTF operations. Marine combat aviation is an integral part of the MAGTF combined arms effort. The Marine Corps advocates

centralized command, decentralized control, and decentralized execution. This doctrine is necessary to provide the responsive, flexible aviation support in a dynamic environment. (6: 4) Marines are concerned that the JFACC may levy excessive requirements on Marine aviation reducing the support provided to the MAGTF. These doctrinal differences between the Air Force and the Marine Corps are an impediment to developing a practical structure to control aviation assets within a theater of operations. Both the Air Force and the Marine Corps acknowledge that the JFACC is necessary to coordinate Joint Air Operations; however, future doctrine must ensure that each service is adequately represented in the planning process to provide effective aviation support in accordance with the Joint Forces Commander's guidance.

FUNCTIONAL COMPONENCY VERSUS SERVICE COMPONENCY

The issue of organization of a joint task force is directly related to the issue of control of aviation within a theater of operations. The Air Force advocates a functional organization for war with Commander Land Forces, Commander Air Forces, and Commander Naval Forces reporting directly to the Joint Forces Commander. (6: 3) In this functional organization for battle, fixed-wing air is organizationally integrated no lower than the joint force level under the JFACC. This philosophy rejects the

service level application of combat air, and maintains that mission attainment is best accomplished by a functionally oriented air component commander who possesses operational control of all combat air assets in-theater. Functional organization for combat, however, does not account for the fact that each of the services have fully integrated forces which cross these functional boundaries.

Conversely, the Marine Corps believes overall joint force mission attainment is best served through the service component organization for battle. According to the Marine Corps, a service component organization will enhance the overall effectiveness of the joint organization when the services are employed in a manner consistent with their designed warfighting capabilities, and in a way that maximizes the effectiveness of those capabilities. The Marine Corps supports the integration of the service components at the joint level through *planning and coordination*, not through consolidated command of all organic aviation assets.

The previous excerpt from the Omnibus Agreement *(JCS Pub 3-01.2 and 3-56.23)* recognizes and accommodates both the functional organization and the service component organization. The JFACC designation can be used under any command arrangement specified by the Joint Forces Commander. Possible command

arrangements include service component organizations, functional component organizations, subordinate Joint Task Forces (JTFs), sub-unified commands, or any other in accordance with *JCS Pub 0-2, UNAAF.* In other words, either the Air Force or Marine Corps doctrine pertaining to organization for combat could be designated by the Joint Forces Commander.

If the Joint Forces Commander decides that a functional component organization would best accomplish the mission, the Omnibus Agreement allows for a MAGTF to operate as a coherent unit under *normal* circumstances. The aggreement also provides flexibility for the Joint Forces Commander, when faced with abnormal circumstances, to redirect efforts necessary to accomplish his mission. With this in mind, the Marine Corps interprets the Omnibus Agreement to mean the JFACC will not always or normally be a functional component commander. Additionally, the Marine Corps disagrees with the JFACC being in the chain of command. Within the Marine Corps' concept of command, the functions of the JFACC are more appropriately implemented as staff functions of the Joint Forces Commander's staff. Within the Air Force's concept of command, the responsibilities of the JFACC - planning, coordinating, allocating, and tasking - are appropriate responsibilities of a separate commander. The Marine Corps contends that the JFACC should not *command* forces other than those organic to him as a service component commander, nor should he exercise operational

control of any forces other than those assigned or attached to him. Finally, the Marine Corps further interprets the Omnibus Agreement to mean that the Joint Forces Commander, not the JFACC, will make the apportionment decision.

The Air Force is in general agreement with the Marine's interpretation of the role of the JFACC except for the Marine Corps' view of operational control. *JCS Pub 1-02* states that the "JFACC derives his authority from the Joint Force Commander who has the ability to exercise operational control." The definition of derive is "obtain from a source or parent." Logic would indicate that since the Joint Force Commander's authority includes operational control then so would the JFACC's. The confusing factor then becomes the question of why *JCS Pub 1-02* later states "The JFACC will recommend apportionment of air sorties." If the JFACC indeed is intended to have operational control, why is he not afforded the autonomy to make apportionment decisions? According to General Powell, "Interdiction and maneuver should not be considered separate operations against a common enemy, but rather complementary operations designed to achieve the Joint Force Commander's campaign objectives." (9: 15-16) The Joint Force Commander should be as involved in allocating air assets as he is in allocating ground assets to accomplish his objectives. It is then the responsibility of subordinate commanders to implement the decisions made by the Joint Forces Commander.

CONCLUSION

While it would seem that the differences between Marine Corps and Air Force doctrines are irreconcilable, great strides have been made since DESERT STORM to resolve the problems. The OMNIBUS Agreement was a first attempt at resolving the issues. Both services recognize the value of strategic air interdiction and the value of tactical support to ground units. However, there are still differences over the amount of control that the JFACC should have in the decision making process. The current joint doctrine provides conflicting guidance regarding the mission of the JFACC and the level of control which he may exercise in coordinating air support in a joint environment.

While doctrine should be flexible enough to allow the Joint Forces Commander (JFC) sufficient latitude to employ his forces to meet the existing threat, it should also provide sufficient guidance to the services so that they may adequately prepare to function in a joint environment. The warfighting Commanders-in-Chief have each developed policy statements to resolve the JFACC issue within their theaters. USCINCLANT, USCINCPAC, and USCINCCENT agree that a JFACC should be designated when air assets of two or more services are represented in a theater of operations. They further agree that the JFACC should be supported by a joint staff with representation from each of the

service components. Each of the theater Commanders-in-Chief recognize that apportionment should be conducted by the CinC based on the recommendations of subordinate commanders. Each CinC further provides a mechanism, through the Joint Targeting Board, for subordinate commanders to provide input regarding targeting priorities. While these measures resolve the issues within the operating forces, joint doctrine should be modified to formalize the way in which we will conduct war in the future.

BIBLIOGRAPHY

1. Beale, Lieutenant Colonel, USMC. Personal interview, MCCDC, 4 Dec 1992.

2. Becker, Michael D., Maj, USMC. "Command and Control of Marine TacAir in Joint Operations." Oct 1988: 50-55.

3. Binghan, Price T., LtCol, USAF. "Air Power in DESERT STORM." Airpower Journal (Winter 1991): 33-45.

4. Commander in Chief, U.S. Atlantic Command and U.S. Air Force, Air Combat Command, "Joint Force Air Component Commander (JFACC) Concept of Operations for the U.S. Atlantic Command and Air Combat Command." Norfolk, VA. J5/01164 of 18 Sep 1992.

5. Commander in Chief, U.S. Pacific Command, "USCINCPAC Joint Force Air Component Commander (JFACC) Concept of Operations." Camp H.M. Smith, HI Ser 1394-92 of 16 Oct 1992.

6. Commanding General, Marine Corps Combat Development Command, "The Joint Force Air Component Commander and Command and Control of Marine Air-Ground Task Force Aviation." Quantico, VA. WF12E of 9 Mar 1989.

7. Cushman, John H., LtGen, USA (Ret). "Fight as a Team." Proceedings (January 1993): 58-62.

8. Eastman, Lieutenant Colonel, USAF. Personal interview, Command and Staff College, MCCDC, 16 Dec 1992.

9. Joint Chiefs of Staff. "A Doctrinal Statement of Selected Joint Operational Concepts." Washington, D.C., 23 Nov 1992.

10. Joint Chiefs of Staff. "Tactical Command and Control Planning guidance and procedures for Joint Operations," JCS Pub 3-56.24. Washington, D.C., Oct 1991.

11. Goodman, Lieutenant Colonel, USMC. Personal interview, Command and Staff College, MCCDC, 19 Nov 1992.

12. Lind, William S. "Maneuver Warfare and Marine Aviation." Marine Corps Gazette (May 1989): 57-64.

13. Sandbakken, Major, USMC. Personal interview, MCCDC, 24 Nov 1992.

14. Saxman, Maj, USAF. "The Role of Marine Aviation in Maneuver Warfare," Marine Corps Gazette (August 1989): 58-63.

15. U.S. Central Command Memorandum, "JFACC Organization and Targeting Boards." MacDill Air Base, FL of 13 Mar 1992.

C4I FOR THE WARRIOR: WILL THIS DOG HUNT?

Submitted to
Major M.K. Snyder
and Mrs. Sandra Kirkpatrick
at the Communication Officers School
Quantico, Virginia

Captain C.R. Bigger, USA
Captain D.L. Robbins, USMC
Captain E.J. Ryan, USAF
Captain A. R. Mellon, USMC

8 April 1993

C4IFTW: WILL THIS DOG HUNT?

OUTLINE

Thesis statement: Successful implementation of C4IFTW is dependent upon overcoming technical issues, budgetary constraints, and lack of cooperation between the armed services.

I. Introduction. The time is right.
   A. Past operations.
   B. Advancing technologies.
   C. Changing Military Strategy.

II. C4IFTW overview.

III. Starting the C4IFTW campaign.
   A. Selling the concept.
   B. The advertising campaign.

IV. The doctrine and policy battle.
   A. DoD Directive 4630.5.
   B. DoD Instruction 4630.8.

V. The first big step: Translators.
   A. Limiting the formats.
   B. Prototypes and demonstrations.

VI. The multi-level security hurdle.
   A. Political problems.
   B. MLS Technology Insertion Program.
   C. Testbeds.
   D. Marine Corps MLS efforts.

VII. The first large scale test: C4IFT(P)W.

VIII. A systematic approach to establishing joint standards
   A. DISA creation/responsibilities.
   B. Standards with flexibility.
   C. Suggested approaches.

IX. The Joint Interoperability Test Center (JITC).
   A. JITC's authority and responsibilities.
   B. JITC's capabilities.

X. Effects of Corporate Information Management Initiative.
   A. Purpose of CIM.
   B. Implementation of CIM.

XI. Conclusion.

Appendix A - 13 Standard Data Formats

C4I FOR THE WARRIOR: WILL THIS DOG HUNT?

INTRODUCTION TO C4I FOR THE WARRIOR

The time is right for an interoperable Command, Control, Communications, Computers, and Information (C4I) system. Recent world events have shown that the C4I systems in the U.S. Armed Forces are not interoperable and that interoperability is a necessity in future operations. Operations Urgent Fury, Just Cause, and Desert Storm identified difficulties that the services experienced in exchanging information. This problem is receiving great attention now that national military strategy is focused on joint and combined operations in regional conflicts rather than on the Soviet Threat. In response to the need for interoperable command and control systems, the Joint Chiefs of Staff, J-6 developed a concept called C4I for the Warrior (C4IFTW). C4IFTW is a global C4I systems infrastructure providing joint interoperability among services for information flow at all echelons. Successful implementation of C4IFTW is dependent upon overcoming technical issues, budgetary constraints, and lack of cooperation between the armed services.

C4IFTW OVERVIEW

The concept, created in response to the recognized need for interoperable systems, is technologically possible based

upon recent advancements in automation and telecommunications. C4IFTW is an evolutionary concept with three phases that will maximize current C4I systems and control future acquisition of C4I systems through the enforcement of interoperability standards. In time, the concept calls for a fully interoperable system which makes battlefield information readily accessible to all combat commanders.

The proposed DoD Directive for "C4I for the Warrior" dated 6 April 1992 provides a concept statement for C4IFTW. It defines the three phases of the concept, and outlines agency and service responsibilities. This directive calls for the warrior (defined as a combat commander at any echelon) to have the ability to plug-in anytime, anywhere, into a global infrastructure which interconnects a number of fusion centers with national databases.

The three phases of C4IFTW are the Quick Fix Phase, Midterm Phase, and the Final or Objective Phase. The Quick Fix Phase is a band-aid remedy to get the services exchanging information quickly using current C4I systems. We will develop a common set of data formats, use translators to merge data systems with different protocols, and enforce interoperability standards during acquisition of new systems. The Midterm Phase, approximately ten years out, will develop the global infrastructure. This infrastructure will use fixed and mobile communications

centers and multi-functional switches as pipelines for all transmission media. This network of fused national databases will be accessible to any warrior. During the Objective or Final Phase, which extends past the year 2000, a fully developed global infrastructure of interconnected automatically updated national databases will be constructed. Warriors and the databases will be connected through national, international, and military telecommunications systems.

STARTING THE C4IFTW CAMPAIGN

In 1991 Gen. Powell, Chairman of the Joint Chiefs of Staff, told Adm Macke, the Joint Staff J-6, to find out why the Marines and the Army had trouble communicating tactically during the Persian Gulf War and to solve the problem. The C4IFTW concept was the result of that conversation.(7) Selling the concept to a skeptical market in the services and the DoD agencies was tough. Service and DoD agency officials have seen previously proposed command and control systems which were touted as the solutions to our interoperability problems. Programs like Tri-Tac produced limited interoperability results and caused conflicts between services and agencies competing for defense dollars. Other concepts have fallen by the wayside once leading supporters have moved on or retired. The fact that C4IFTW is not threat driven (i.e. developed

specifically to counter an enemy capability) and the successful outward appearance of the Desert Storm C2 may lead some to believe this initiative is not necessary. Additionally, the concept was not originated by the "operators" and is not as tangible as a new artillery piece. The J-6 staff needed a strategy to get the concept accepted and into the individual service/agency/CinC agendas.(7)

The services, past and present, continue to work on their own solutions to the C2 problem, with each service developing systems of its own. Rather than starting from scratch with a new comprehensive system, the C4IFTW concept looks to ensure that the service developed systems will be interoperable and complimentary.(7) Unifying all of these efforts and individual interests and selling them to the market took advertising.(7) The approach used to sell C4IFTW concept is a significant part of the concept itself. Getting the services and agencies on the bandwagon of interoperability is the only way the problem will be solved.

In 1991 Adm Macke, with Col Bryan of the J-6 office, developed a brief to deliver to the Joint Chiefs and the brief has expanded dramatically since then.(7) The "advertising campaign" contributed to the development of the C4IFTW concept, as simple ways of expressing complex problems were refined. Brochures were developed in house using contractors for graphics and printing. Over 12,000 have been distributed. Video brochures, including a 90

minute presentation, were produced with professional assistance. "Tiger Teams" were established and dispatched to the CinC's to provide briefs and solicit comments. Groups ranging from Congress to the American Petroleum Association have received C4IFTW presentations. The J-6 staff has attempted to sell and institutionalize the C4IFTW concept at all levels.(7) Although some may see the advertising effort as time and money taken away from actual concept development, the effort was a necessary expense and should continue in order to cultivate C4IFTW followers. Only if senior service members are convinced of its viability will the concept survive.

Advertising does little without concrete product performance to back it up, and the J-6 staff has put a great deal of effort into making real progress toward the concept's implementation. They proudly point to long list of "trophies," or accomplishments, to show the concept's approach is working. Some of these trophies, such as establishment of doctrine and policy, and the development of translators will examined throughout this paper.

THE DOCTRINE AND POLICY BATTLE

A tangible step toward institutionalizing C4IFTW is Department of Defense (DoD) Directive, Number 4630.5, SUBJECT: Compatibility, Interoperability, and Integration of Command, Control, Communications, and Intelligence (C3I)

Systems, dated November 12, 1992. This precedent-setting policy directs integration of C3I systems and assigns responsibilities to the CJCS and armed services during development and acquisition of new C3I systems and equipment.

The policy directs that forces involved in joint or combined operations must be supported by an integrated C3I system that is interoperable. It calls for services to develop and acquire interoperable systems that meet essential operational needs of U.S. Armed Forces. In line with the direction of C4IFTW's Objective Phase, paragraph D.4 of the directive states, "For the purposes of compatibility, interoperability, and integration, all C3I systems developed for use by U.S. Armed Forces are considered to be for joint use."

DoD Directive 4630.5 and DoD Instruction 4630.8 establishes responsibilities for compliance with the directives. Most notably the Chairman of the Joint Chiefs of Staff is directed to establish procedures for development and validation of compatibility. The CJCS is also responsible for approving, documenting and exercising doctrinal concepts. The Defense Information Systems Agency (DISA) will test and evaluate C3I systems. It will administer compatibility, interoperability, and integration certification tests and certify to the CJCS that the C3I system operate within a joint interface.

DoD Directive 4630.5 and DoD Instruction 4630.8 set a precedent by placing a higher level of control over the services in their acquisition of C3I systems. The necessary testing and review are required prior to funding, thus strong arming the services into compliance. The actual effectiveness of the instruction will, of course, depend on how strictly the Joint Staff and DISA enforce the instruction's intent.

THE FIRST BIG STEP: TRANSLATORS/INTERPRETERS

A major tool in the near-term, quick-fix phase is the interpreter (or translator). An interpreter is a special software program that takes the language that one command and control system speaks and translates it into language that another command and control system can understand. A fully integrated set of interpreters would enable almost all of the U.S. military's command and control systems to share information. Such a solution, though, is complicated by the more than 50 major command and control systems operated by today's U.S. military.(5)

To build an interpreter, the J-6 C4IFTW Interoperability Tiger Team first set out to define a set of data format standards. After studying existing systems and data format standards, the Tiger Team devised a set of 13 formats (see Appendix A) which will provide basic interoperability between the existing systems.(5) The Tiger

Team then took this set of data formats to the CINCs to solicit their suggestions and to further refine the formats.

With the data format standards in hand, the next step was to create a prototype interpreter and provide a proof of concept. On 20 November 92, the Naval Electronic Systems Engineering Activity (NESEA) demonstrated the initial prototype interpreter, the Joint Universal Data Interpreter (JUDI).(2) This first version of JUDI provided a limited interface capability between the Army's Standard Theater Army Command and Control System (STACCS) and the Navy's Joint Operational Tactical System (JOTS).(2) In March 1993, NESEA demonstrated a fully integrated capability between these two systems, and, on 7 April 1993, NESEA showed an integrated capability between JOTS, STACCS, the Marine Corps' Intelligence Analysis System (IAS), and the U.S. Air Force's Air Situation Display System (ASDS).

The next step is to install the JUDI prototype into European Command (EUCOM) for use as an operational testbed. Initial interoperability tests with the USCINCEUR Command Center System (UCCS) have been completed. In April 1993, the fully integrated JUDI prototype is scheduled to demonstrate its capabilities within EUCOM.(2)

The U.S. Air Force's Contingency TACS Automated Planning System (CTAPS) will be the next command and control system to be integrated. The demonstration of this capability is scheduled for May 1993.(2) Continued

interpreter/translator development, vital to the Quick-Fix Phase of the C4IFTW program, is ahead of schedule. Current advances are bringing the first phase of the C4IFTW program much closer to successful completion. As work on interpreters continues, DISA, the CINCS, and the individual Services are collectively working to pare down many of the superfluous command and control systems currently in existence. Continued integration, and, if necessary, elimination, of U.S. military command and control systems in the Quick-Fix phase will give future C4IFTW efforts a solid foundation on which to build. However, failure to meet the near-term goals could mark C4IFTW as another fly-by-night proposal and potentially eliminate much needed support.

THE MULTI-LEVEL SECURITY HURDLE

One technological obstacle which must be overcome for the C4IFTW "global infrastructure" concept to work is the multi-level security (MLS) issue. Currently, data networks dealing with various levels of classified information are kept separate, requiring redundant computers, servers, and transmission paths for each. C4IFTW envisions a single network which can be used for all levels of classified information and yet retain the abilit, to closely control access to each level. "MLS may be a show stopper," says one senior JCS officer.(7)

The problems appear to be both political and technical, according to experts on the DoD MLS problem.(15) The National Security Agency (NSA) is responsible for setting the standards for DoD computer security. The rules and guidelines for establishing multi-level security systems are defined in the Trusted Computer System Evaluation Criteria issued by the NSA.(14) These guidelines, and the NSA, have been criticized for their inflexibility when applied to the tactical level of DoD data networks. By applying the same rigorous standards to tactical systems which are applied to strategic systems, NSA creates a potential seven-year technology gap. (15) In the NSA's defense, its penchant for not trusting people or software, only hardware, to solve the MLS problem is grounded in the long history of security apathy in the DoD computer user community. NSA points out that in the future all tactical systems will be linked to strategic systems, requiring the same protection.

The MLS Technology Insertion Program (MLSTIP) was established to coordinate the efforts of the various interested DoD parties. The program's functions to are oversee and coordinate the use of resources, to establish efficient testbeds, and to develop plans and architectures.(19)

Currently, when using data networks (separated by classification), transferring large files such as Oplans can take up to six hours.(18) The envisioned systems will link

the variously classified networks and have "trusted" hardware at the connections to insure only authorized information is shared. One DoD expert describes the system as one big pipe with many smaller ones inside and valves to control the flow and interconnectivity at various intervals.(15)

In February 1993, the Defense-Wide Information Security System Program (DISSP) unveiled an architecture plan to make this concept a reality. Other MLS related programs must align within this architecture in long term applications. (18)

The core requirements to make the MLS program work are:

-Secure system interface.

-Secure networks.

-Secure multi-level workstations.

-Secure reclassification (downgrading).

-integrations of secure components, to include: guards, workstations, LAN, and host architectures.

-Secure shared data base (the longest-term problem). (18)

Many MLS advances have already been achieved. The testbed established by the MLSTIP has been very successful in creating working models at the U.S. Transportation Command (TRANSCOM) and the U.S. Central Command (CENTCOM). At TRANSCOM, the Air Mobility Command Global Decision Support System now has linked a top secret network with a

secret network using a trusted guard.(18) Tiger Teams have visited all Unified Commands and are addressing similar requirements with surprising speed. Many of the CinCs will have trusted systems on line in the next few months. In 1994 a multi-level electronic mail system is expected to be in place and MLS workstations will be introduced.(18)

The services are also very involved in the MLS development process. Each service has a program pertaining to its MLS needs. The Marine Corps will continue to separate tactical data networks of differing classification, but anticipates combining some networks by 1995. It is examining connecting tactical and strategic networks with a trusted interface called a Logical Coprocessing Key (LOCK). Additionally the Marine Corps is working with the SAIC corporation to develop a near term MLS system for use at the Marine Expeditionary Force (MEF) and MEF Forward (MEF FWD) level.(14)

While the MLS problem is perhaps the most technology driven hurdle in the C4IFTW concept, it is solvable. In fact, recent predictions of full implementation in 2000 may be conservative with the rate of technology development today.(19) The key to this technological solution will be money. Whether or not the DoD and the services will continue to put money into MLS development will be determined by the upcoming budget cuts and the priority placed on developing the C4IFTW concept. The responsibility

for prioritization will lie with the individual services.

THE FIRST LARGE SCALE TEST: C4I FOR THE PACIFIC WARRIOR (C4IFT(P)W)

C4IFT(P)W is the prototype program that will prove, on a large scale, the concepts and technologies of the C4IFTW vision. The United States Pacific Command's (USPACOM) vast area of responsibility presents a great communications challenge for CINCPAC. However, this challenge also provides an excellent arena for testing interoperability concepts.

USPACOM has already taken the lead in integrating its command and control systems by making the Operations Support System (OSS) its common CINC command and control system. The OSS is a program that integrates the following sub-systems on a LAN: the Operational Support Group Prototype (OSGP), the Joint Operational Tactical System (JOTS), and the Fleet Command Center Battle Management Program (FCCBMP).(12) USPACOM is planning to install OSS terminals at all of its components, connecting them with a Wide Area Network (WAN).(12)

USPACOM has also taken the lead role in implementing the two tier Command and Control concept where the JTF commander reports directly to the CINC, versus the traditional three-tiered system of reporting via the service components. As a result, CINCPAC created the Enhanced

Crisis Management Capability (ECMC) group which contains a suite of JTF command and control equipment that can be rapidly deployed. This equipment is connected to other USPACOM command centers via the Officer in Tactical Command Information Exchange System (OTCIXS) to form the Joint Area Information System Pacific (JAISPAC). This system provides positional and narrative messages for the JTF.(12) Looking to the future, C4I For The Pacific Warrior has created a roadmap of execution options that, if funded, will further work to prove the value of the C4IFTW concepts.

A SYSTEMATIC APPROACH TO ESTABLISHING JOINT STANDARDS

C4IFTW will not become a reality by simply establishing the standards for the joint exchange of information. But identifying joint standards is a logical and feasible first step in the evolution of the ultimate system. Identifying joint standards, although an evolving process which influences all future systems, represents the swiftest and least costly path to provide joint interoperability in the short term, or Quick Fix Phase.

The current tactical information systems that exchange information through a joint architecture certainly do not meet all the requirements of the definition of what C4IFTW needs; however, they will establish a useful information base for a joint or combined theater of operations.

A major "trophy" for defining C4IFTW joint standards has been placed upon the J-6 shelf with the establishment of DoD Directives 4630.5 and 4630.8. These directives have institutionalized the Defense Information Systems Agency (DISA), along with its subordinate affiliate, the Joint Interoperability and Evaluation Organization (JIEO) as the DoD focal point for standards.(3)

By requiring all C3I systems developed for use by the U.S. Armed Forces to be considered to be for joint use and required to meet joint standards, these directives have provided the needed impetus for service subordination to DISA and JIEO. Now, services interested in C3I system development, procurement, or use must first ensure joint C3I system compatibility, interoperability, and integration before they can purchase the equipment.(3) The reality: no interoperability, no money.

Interoperability requires defining the criteria for exchanging information. A straight-forward definition of the joint standard for C4IFTW would meet this criteria. We must avoid the historical tendency to define the total system in too much detail. If an all encompassing set of standards is included in the definition, the C4IFTW's joint information exchange standard will drive costs well beyond budget constraints and prove to be impossible to meet. The program will eventually lose both popular support and, finally, financial backing. Numerous systems developed in

this fashion, though perhaps well intended, fill the information systems' grave yard.

Instead, a more flexible and realistic approach is needed to define the criteria for the joint exchange of information and will serve the purpose of realizing the Objective Phase. For, just as the method of war continues to evolve, the warrior's communication and information requirements also will evolve. By simply defining the data elements, data base, and communications protocol required to input and extract information in a joint environment, the ingrained flexibility and growth characteristics of this approach will support the warrior's changing requirements. These joint standards will then be sufficient to ensure information can be exchanged between machines and systems, regardless of service affiliation. Thus, the interfaces are the key elements that need to be identified in the joint interoperability standard.

A systematic approach to defining the C4IFTW joint interoperability standards must be established. This approach will not eliminate existing standards and systems, but on the contrary, focus initial effort on all current assets, systems, facilities, and industries available. MTF, TADIL, logistic data elements, and personnel systems' standards, just to name a few, would be an easy enough target for the up-front investigation in order to learn what is "salvageable" and applicable for C4IFTW joint standards.

If their standards are found feasible to the C4IFTW cause, the Defense Advance Research Project Activity (DARPA) would be commissioned to catalogue these existing standards across the board.

The next step to this systematic approach is to continuously look to the commercial industry for standards that apply to the C4IFTW effort. With shrinking DoD budgets a reality, maximum service use of commercial off-the-shelf (COTS) systems, technologies, and equipment will minimize, and may in time even eliminate, related DoD research and (R&D) costs. Taking full advantage of COTS advancements will therefore play an ever increasing roll in C4IFTW standards and technology, and help to ensure the success and longevity of C4IFTW. In addition, coordination with the ongoing efforts of the Corporate Information Management (CIM) initiatives will further facilitate C4IFTW planners the ability to keep abreast of the latest developments and availability of private industries' state of the art technologies. Maintaining close contact with private industries and establishing a working relationship with them will ensure optimal support to the warrior through an evolutionary and dynamic C4IFTW joint system.

The final step in this systematic approach is the requirement to remain both flexible and efficient when identifying elements which comprise the C4IFTW's joint standards. The approach must be flexible to change, for the

warrior's requirements will surely change throughout the evolution of C4IFTW. While meeting the warrior's requirements, the number of joint standards needs to be kept as low as possible.(3) Grouping information that has common use or definition into a few categories will be cost effective and facilitate joint operability testing.

JOINT INTEROPERABILITY TEST CENTER (JITC)

Just as C4IFTW will not be realized by merely establishing and promulgating the standards for the joint exchange of information, testing established joint standards with today's procedures is inadequate to ensure true joint interoperability and will also fail to contribute to C4IFTW's Objective phase realization. An unbiased facility with no affiliation to any one service or private industry had to be identified. This facility would conduct testing for compliance with the established and true joint interoperability standards and provide interoperability certification. The Joint Interoperability Test Center (JITC) at Fort Huachuca, Arizona, has been identified as the site to provide this critical support.(9)

JITC can provide the CINCs, services, agencies, and others a real world evaluation of C4IFTW standards at the degree of joint interoperability within the confines of their facility and through an eventual dial-in network.(3) JITC's charter for testing joint interoperability standards

will ensure that both new and modified systems, along with data formats vying for entry into the C4IFTW project meet all joint interoperability standards prior to funding.

With DODD 4630.5 and 4630.8 firmly established, the JITC participation in C4IFTW will play an integral part in the overall success of the testing and development of all C4IFTW joint standards and systems. Sensitive to current budgetary constraints, JITC's testing for interoperability throughout the C4IFTW process, as opposed to JITC's waiting on a production model from which to perform the interoperability testing, will permit cheaper modifications. Further, the dial-in testing network established by the JITC is extensive and growing. Tremendous cost savings will be realized through this network. Equipment (military or commercial) does not have to be sent to Fort Huachuca, Arizona. Instead, it can be subjected to JITC's interoperability testing through the dial-in testing network. This capability will enable testing in the early stages of development while maintaining the low cost benefit.

EFFECTS OF CORPORATE INFORMATION MANAGEMENT INITIATIVE

The Corporate Information Management (CIM) initiative, a management method commonly referred to in the private sector as Business Process Improvement (BPI), is now also used by DoD. Its purpose is to reduce Defense Management

Report (DMR) costs while maintaining or improving the effectiveness of military missions. It accomplishes these cost savings and stream-lined procedures by eliminating non-value-added work and, more importantly, by improving the management of information. As a result, CIM has played, and will continue to play, an important role in DoD by facilitating the adoption of more efficient business management practices to even tactical systems, including C4IFTW. CIM's positive impact on C4IFTW will focus on satisfying the warriors information requirements, progress to the Objective Phase by way of small steps, returning to basics, ensuring centralized policy direction, facilities, and system procurement, and finally, decentralized execution.(1) However, even with these far reaching benefits foreseen, inherent problems do exist.

Although the CIM Initiative has made progress through conceptual acceptance, its actual implementation by DoD has been criticized as slow and detrimental to the C4IFTW effort. This dragged foot, on the part of DoD, has resulted in lost benefits to the C4IFTW progress, not soon, if ever, to be recovered. Its reluctance to implement this initiative may be justified, for CIM is one of the largest information management initiatives ever undertaken. DoD's success in coming to terms with this management challenge is threatened by three interlocking problems--issues that center around whether DoD can change long-standing,

fundamental aspects of its culture and whether business processes or technology becomes the driving force in managing DoD information.(10)

First, all agencies (DoD, CINCs, and Armed Services) are attempting to redefine their roles and missions in an attempt to justify their existence and claim their fair share of the budgetary pie. DoD has not established formal policies or directives addressing how the respective roles of the military services and the Office of the Secretary of Defense (OSD) should change to meet CIM's goals, even though CIM requires that control over business operations be centralized. This lack of direction from DoD, although not completely detrimental to the C4IFTW effort and progress, has, to a certain degree, inhibited its subordinate agencies' ability to define their information management requirements and procedures.

Second, control over funds for managing functional areas has just recently shifted. Now, OSD is to be responsible for managing business decisions and control of these funds no longer remains with the services. Although this change is a significant step in the right direction, service autonomy remains a key barrier.

Third, in what represents a business-as-usual approach, DoD is focusing on selecting specific technology, without concurrently determining what the goal of its C4IFTW system should be and what, if anything, needs to be changed to

bring that vision about. Every service is headed on an individual tangent, hoping to create the C4IFTW system for itself alone. To individually select the technology before making the necessary up-front directional business decisions concerning how information will be managed is like placing the cart before the horse. This out of sequence selection invites risk, creates an illusion of C4IFTW progress, and precludes a substantial portion of CIM's projected thirty-six billion dollar savings. Further, this type of selection is an inefficient way of supporting the [illegible]ior, ways that, although automated, will not serve the common goals of tomorrow. The concept of incremental improvement is not at issue. On the contrary, for C4IFTW to survive, incremental business decisions concerning information management must be made before technology is selected.

CONCLUSION

The C4IFTW concept will work. The technologies do exist to make interoperability, global infrastructure, and multi-level security systems realities. The crux of the problem is funding. The C4IFTW concept will be successfully implemented if enough money is dedicated to make it work. With today's budgetary woes, whether the money will be available is in doubt.

Beyond the availability of the money lies the question of service priorities. The money will be spent according

the priorities of the individual services. The value they place on the C4IFTW concept is dependent on whether compliance to C4IFTW standards is tied to acquisition funding. Simply put, if the proposed system does not meet the standards, funding should be denied.

Current doctrine, while well ahead of just one year ago, still does not clearly state that if a service wants to buy a C4I system, the system must be interoperable with the other services, and conform to well defined DoD standards, or it will not be funded. The doctrine does state new systems will be "for joint use," but does not set specific standards. A service may show that the system is available for purchase by the other services, and offer that this fulfills the "for joint use" requirement.

Current approaches to promulgating the C4IFTW concept are on the right track. The "advertising campaign" to convert the service oriented to the joint oriented must continue. All of the "trophies" in the world will not convince some DoD personnel of the dire need for setting aside service agendas in favor the common good. Joint working groups, common testbeds, and shared information are appropriate tools for development of the technology and should be expanded for quicker results.

The Joint Staff has identified the root of the problem as Gen Powell asked them to. It has developed a roadmap for solving the problem. The solution lacks only two key

variables: money and full cooperation of the services. The money may or may not be forthcoming in the future. The DoD has little control over the budgetary future. The cooperation of the services will only come with strict funding control.

Appendix A

13 Standard Data Formats (5)

USE	FORMAT	LONG NAME
Positional	OTG	Over The Horizon Targeting - Gold
	TACREP	Tactical Report
	TACELINT	Tactical ELINT
Fire Support	TACFIRE	Tactical Fire
Intelligence	IDB TF	IDB Transfer Format
Narrative	GENADMIN	General Administration
Flight Operations	ATOCONF	Air Tasking Order Confirmation
Logistics	MILSTRIP	Military Standard Requisitioning and Issue Procedures
	CASREP	Casualty Report
Personnel	SORTSREP	Status of Resources and Training System Report
Force Deployment	ORDER	Order Report
	TPFDD	Time-Phased Force Deployment Data
Force Employment	SITREP	Situation Report

BIBLIOGRAPHY

1. Assistant Secretary of Defense (C3I). Corporate Information Management, Pentagon (OSD). April 1991.

2. Balderman, M., LtCol. "Information Paper, Subject: C4I For The Warrior Update." Pentagon (DISA). 7 Jan 1993.

3. Bryan, D., Col, USA. Executive Summary, C4I for the Warrior, Pentagon (J-6). 8 Jul 1992.

4. C4I Architecture and Integration Division (J-6), The Joint Staff, C4I For the Warrior, Pentagon (J-6). 2 June 1992.

5. C4I Architecture and Integration Division (J-6), The Joint Staff, C4I For The Warrior Interoperability Tiger Team Final Report, Pentagon (J-6). 26 May 1992.

6. C4I Architecture and Integration Division (J-6), The Joint Staff, "Memorandum, Subject: DoD Directive for C4I for the Warrior." Pentagon (J-6). 6 April 1992.

7. Cramer, S., LtCol, USMC. Personal interview, Pentagon (J-6). 28 Jan 1993.

8. Department of Defense. Defense Management Report Decision 918. Pentagon (OSD). 9 Sept 1992.

9. Department of Defense Directive, Number 4630.8, Pentagon (OSD). 12 Nov 1992.

10. Department of Defense Inspector General Memorandum for Assistant Secretary of Defense (C3I). Defense ADP: Corporate Information Management Must Overcome Major Problems. Pentagon (DoDIG). 30 Oct 1992.

11. Department of Defense Instruction, Number 4630.8, Pentagon (OSD). 18 Nov 1992.

12. Defense Information Systems Agency, "DISA Status Briefing on C4I For The Warrior Initiatives." Pentagon (DISA). 14 Jan 1993.

13. Endoso, Joyce. "Joint Chiefs Call for Worldwide Warfighting Network." Government Computing News, 17 Aug 1992:64.

14. Fan, D. Program Specialist, MARCORSYSCOM. Personal Interview. Quantico. 14 Jan 1993.

15. Kurtz, D. Compusec Specialist, MCCTA. Personal Interview. Quantico. 14 Jan 1993.

16. Marine Corps Computer and Telecommunications Activity (MCCTA), CIM and DMRD 918. Quantico. 12 Jan 1993.

17. "Marine Corps Network Security Issues Brief." C4I, HQMC. 2 Oct 1992.

18. Schwartz, Errol. Class lecture. CCSC, COS, MCCDC, Quantico, Virginia. 27 Jan 1993.

19. West, Charles. Target Architecture and Implementation Strategy for the Joint MLS Technology Insertion Program. MLSTIP, DISA. Pentagon (DISA). Sept 1991.

CAN THE MARINE CORPS SUPPORT THE MARINE COMPONENT AND COMMANDER OF THE JOINT TASK FORCE?

Submitted to
Major T. Learn
and Mrs. Sandra Kirkpatrick
at the Communication Officers School
Quantico, Virginia

Captain B.S. Blankenship, USMC
Captain K.R. Chambers, USMC
Captain D.M. Ross, USA
Captain D.S. Rowe, USMC

April 8, 1993

CAN THE MARINE CORPS SUPPORT THE MARINE COMPONENT AND COMMANDER OF THE JOINT TASK FORCE?

OUTLINE

Thesis statement: The Marine Corps can support the Marine Component and Commander of the Joint Task Force simultaneously with the exception of some equipment which can be resolved through augmentation from the JCSE and other services using Memorandums of Agreement.

I. Staffs and C3 information exchange requirements

   A. JCS J-2 functions and requirements
   B. JCS J-6 functions and requirements

II. Identifying personnel requirements

   A. Manning the J-6 with qualified personnel
   B. The battle roster concept: Is it practicable?
   C. The FSPG - expanding the communications battalion

III. Supporting component communication requirements

   A. JTF communication requirements - JCSE support
   B. MARFOR communication requirements - MOA support
   C. Identifying equipment shortfalls

IV. Acquisition of interoperable communication equipment

   A. Switching equipment
   B. Multichannel equipment
   C. GMF satellite equipment
   D. Digital technical control equipment

V. The COMSEC Material System (CMS)

   A. Managing the Intertheater COMSEC Package (ICP)
   B. Establishing a Marine COMSEC Management Office
   C. MCMO in a joint environment

IV. Data networks in the joint environment

   A. Integrated data networks in a joint environment
   B. Security of data networks

VII. The Marine Corps needs augmentation to support the Marine Component and Commander of the Joint Task Force. This report presents a method that allows the Marine Corps to support both simultaneously with Memorandums of Agreement augmentation until the necessary equipment is procured.

CAN THE MARINE CORPS SUPPORT THE MARINE COMPONENT AND COMMANDER OF THE JOINT TASK FORCE?

This report presents the Marine Corps with a method for dealing with the issue of supporting the Marine Component and Commander Joint Task Force (COMJTF) simultaneously. There are many issues to be resolved if the Marine Corps is to support JTF and Marine Forces (MARFOR) component. Our focus is on those areas related to command, control, and communications (C3). Our evaluation of the problems involved in a Marine COMJTF indicates that the Marine Corps can support the Marine Component and the COMJTF simultaneously except for some equipment resources which can be acquired through augmentation from the Joint Communications Support Element (JCSE) and other services using Memorandums of Agreement (MOAs).

Until recently the Marine Corps has organized, trained, and procured as a single service with the expectation of performing unilateral combat missions. Recent history has proven the need for multilateral operations and interoperability in such operations as the Mayaguez rescue effort, the Iranian Hostage rescue effort, Operation Urgent Fury, and Operation Just Cause. Congress enacted The 1986 Department of Defense (DOD) Reorganization Act, commonly

known as The Goldwater-Nichols Act, which emphasized unity of effort among the services and streamlined the chain-of-command within the DOD. Immature doctrine for joint operations, fiscal constraints, and force restructuring have complicated the Marine Corps' efforts to succeed in the joint arena.

Despite the complications, the Marine Corps must be able to operate in a joint environment. This paper identifies problems and recommends solutions in the areas of personnel support, communication equipment support, and the communication security (COMSEC) material system as they relate to C3 functions of the J-2 and J-6 within a JTF. The Marine Corps faces the most difficulties in terms of support with regards to the C3 information exchange requirements.

C3 INFORMATION EXCHANGE REQUIREMENTS

The COMJTF has information exchange requirements with higher, subordinate, supporting commanders, commanders of allied forces, and heads of government agencies (14: 3-1). The formation of a staff, J-1 through J-6, is the key to effective C3 coordination. Our focus is on the J-2 who is responsible for establishing the Joint Intelligence Center (JIC) and the J-6 who is responsible for setting up the Joint Communications Control Center (JCCC). Although it is the CINC's responsibility to form a joint staff, he usually delegates this responsibility to the COMJTF. The quickest

way for a Marine COMJTF to assemble a staff is to use the MARFOR G-6 staff as the J-6 staff, but it is not necessarily the best choice. The joint staff should contain a mix of the services. The COMJTF should choose the most qualified subject matter expert for each job.

Intelligence Information Exchange Requirements

One of the most critical responsibilities of the JTF Headquarters is to collect and disseminate strategic and tactical intelligence. The J-2 Directorate interfaces with national agencies such as the National Security Agency (NSA), Central Intelligence Agency (CIA), and Defense Intelligence Agency (DIA). The JIC needs to have access to the information from these national sources which arrives in theater over Ground Mobile Forces (GMF) satellite. The J-2, J-3, and the J-6 must coordinate the strategic intelligence requirements prior to the deployment and then adjust the requirements for intelligence operations within the JTF. The MAGTF utilizes organic surveillance and reconnaissance assets to gather tactical intelligence. This information is then passed to JTF through MARFOR for analysis. Standard intelligence operations for a JTF are depicted in Figure 1 below. The information collected at the JTF level is disseminated via the Wide Area Network/Local Area Network (WAN/LAN) all the way down to the battalion level. Intelligence information received from the battalion's

organic reconnaissance units is also sent to higher headquarters via the WAN/LAN.

JOINT C3 CONNECTIVITY FOR THE J-2

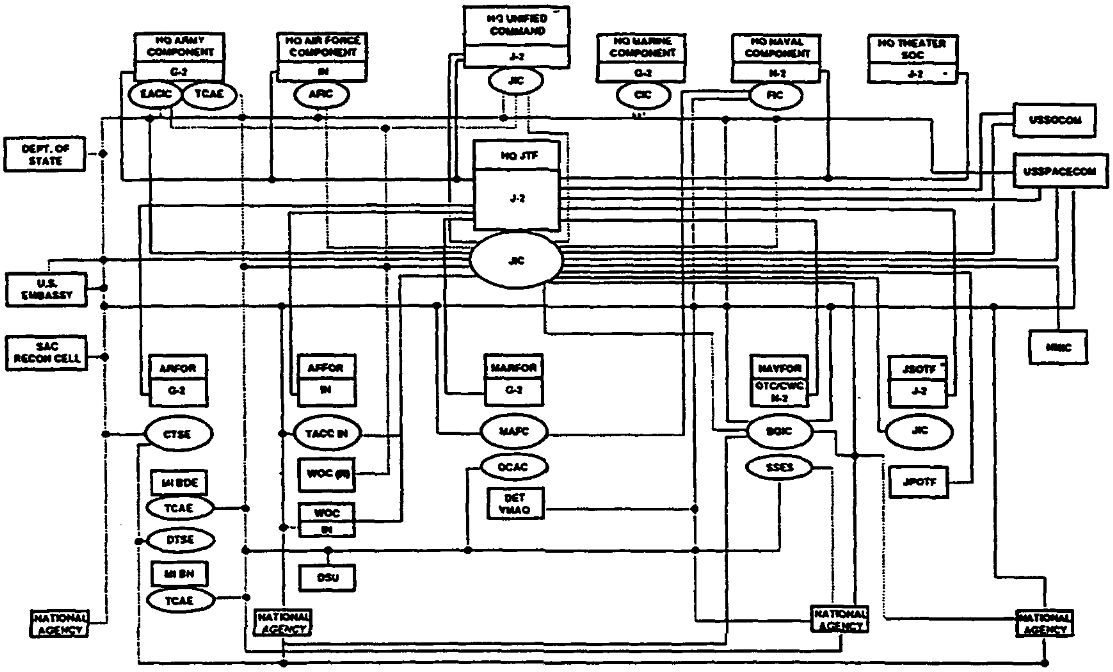


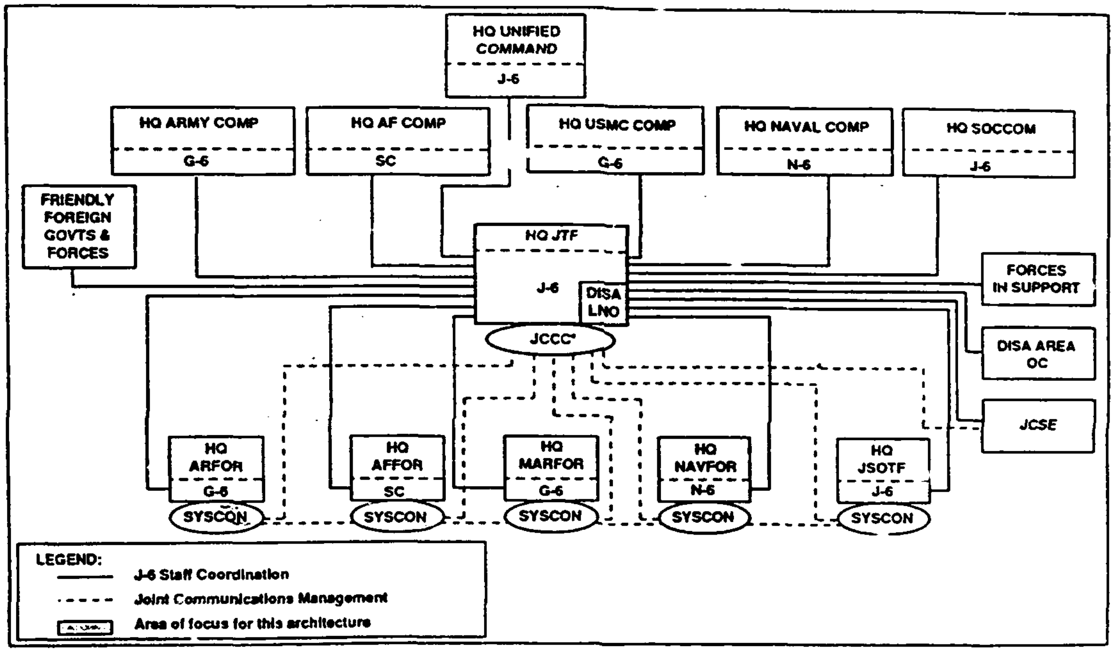
Figure 1 (14:3-12)

Communications Information Exchange Requirements

The J-6 is the designated C3 Systems Directorate of the JTF Headquarters (HQ) as is the G-6 for the MARFOR HQ. The J-6 staff manages JTF frequency allocation, deconflicts internal frequency requirements, and establishes the JCCC. The JCCC serves as the single control agency for management and operational direction of the joint C3 systems. The JCCC staff also includes an Automatic Message Processing Security Officer (AMPSO). The JCCC executes responsibilities through

extensive coordination with the component communications control centers. The JCCC should represent personnel from all services involved in the operation to ensure efficient coordination among the components. Standard C3 systems operations for a JTF are depicted in Figure 2 below.

JOINT C3 CONNECTIVITY FOR THE J-6



*Technical management may be delegated to any SYSCON.

Figure 2 (14:3-35)

PERSONNEL REQUIREMENTS

When the MARFOR is deployed as a separate component, a new layer of C3 requirements is associated with that headquarters. Personnel will increase because of the additional staff responsibilities and communications systems

needed for the MARFOR component and the JTF. The CINC should provide some personnel augmentation to support the J-6 staff; however, the most common practice is for the COMJTF to take people from his own G-6 staff to fill out the J-6.

Augmenting the J-6 staff with personnel from the MARFOR G-6 staff presents a couple of problems. The first issue is that of training communicators to operate in a joint environment. The second issue is that of replacing the MARFOR G-6 personnel who have joined the J-6 staff.

First, Do We Have A Training Program To Ensure That The Personnel Are Qualified To Operate In A Joint Environment? Reports from JTF Somalia and the Ocean Venture 92 exercise suggest that our G-6 staff lacks the training and background to plan and employ communications in a joint TRI-TAC network. MARFOR units found that they must operate as junior partners in the network because they have to rely on personnel from other services to engineer and troubleshoot the network. (1 and 10) The Marine Corps needs more than battalion communications officers at the MEF staff level. The Marine Corps does not have a training program that adequately prepares the communicators for MEF level or joint operations.

A solution to this problem will require the Marine Corps to spend money on training programs whether they are internal or external to the Marine Corps. To develop and

staff the schools necessary to train communicators for joint operations is a solution, albeit a costly one. However, the Army has several courses available: an eight-week K-7 course that trains staff non-commissioned officers (NCOs) and junior officers in TRI-TAC network planning and a twenty-week Information Systems Staff Officers Course which provides in-depth training in TRI-TAC systems planning and engineering (SPE). (16) Given fiscal and manpower constraints, the Marine Corps would benefit the most from coordinating with the Army for cross-instruction. It would also benefit the Army to have a Marine instructor on the Army staff to teach the TTC-42 planning and interface criteria.

All of the services are having difficulty training personnel to be joint qualified. This is not solely a Marine Corps problem. The services will benefit if the Joint Chiefs of Staff certifies existing courses for joint operations in the various battlefield operating systems (i.e., communications, intelligence, etc.). For example, the Army's TRI-TAC Systems Planning and Engineering Course or some equivalent could be modified to ensure that graduates are adequately qualified as joint network planners. If more courses were certified as joint courses, more personnel would have the background knowledge to perform successfully on a joint staff. The Marine Corps could also use this opportunity to train communicators for a

MARFOR staff billet.

Second, there must be a plan to replace the deployed MARFOR G-6 staff. Both MARFORPAC and MARFORLANT are independently developing solutions to this problem. MARFORLANT considers its current staff size of seven officers and eleven enlisted to be adequate for a deployed MARFOR G-6 staff. (1) MARFORPAC has developed a table of organization (T/O) requiring twenty-four officers and sixty-eight enlisted for its deployed MARFOR G-6 staff. (5) Operations Desert Storm, Tandem Thrust, and Green Hammer suggest that the larger staff developed by MARFORPAC would better handle the increased workload of a deployed MARFOR G-6 staff. (10)

Where Does The Expanded MARFOR G-6 Staff Necessary For Handling The Increased SPE Come From?

The most common solution to this problem is the battle roster process. After-action reports from JTF Somalia and exercise Tandem Thrust indicate that the battle roster process is unsuccessful. (10 and 17) One of the problems associated with the battle roster process is ensuring that the person identified for the battle roster slot is adequately qualified. The battle roster position must be specified by T/O and line number and the individual slotted in that billet should attend the appropriate training before checking in to the supporting organization. Another problem

with this process is the need for these people to train periodically with the MARFOR staff before deployment to enhance operations. Deployment time is too late to learn a key player's abilities or to learn the system as the new person on the staff. Support for the battle roster process is weak because most officers and senior NCOs, considered vital to an already lean staff, will not easily be given up by the parent command to support a battle roster billet in an exercise.

MARFORLANT plans to deploy its regular staff and backfill with either battle roster personnel or reservists. This eliminates the problems of training associated with using a battle roster; however, we feel that this approach is unrealistic when using the size staff proposed. (1) MARFORPAC also does not intend to deploy battle roster personnel. It prefers to use Individual Ready Reserves (IRRs) and Individual Mobilization Augmentees (IMAs) to fill out the deployed MARFOR staff while using the battle roster personnel to backfill its garrison billets. (5) Because there is a lack of trust in the battle roster process, the use of a battle roster to augment the MARFOR staff is ineffective. If the battle roster process is emphasized and enforced, it would be a viable and effective solution to the manning problems associated with deploying a MARFOR. The use of IRR and IMA reservists to augment the deployed MARFOR staff and to backfill garrison billets presents a better

solution if training is maintained.

MARFOR HQ requires more communication personnel to support the additional layer of communication requirements. Current Marine Corps T/Os have no specific organization to handle these new requirements. This shortfall was recognized early by the Warfighting Center at Quantico. The Center convened the Force Structure Planning Group (FSPG) in 1991 to formulate a plan for meeting these new requirements. The FSPG plan would increase each communication battalion by approximately 580 personnel. Some of these personnel would staff a third communication company within the battalion with a mission of supporting the deployed MARFOR HQ. The remainder would support a more robust communication capability for the communication battalion overall. HQMC has approved the FSPG plan; however, it will be several years before the personnel and the equipment they support are in place. Additional cuts in Marine Corps strength could adversely affect this plan. (2 and 6) The following figure depicts the proposed personnel requirements for a deployed MARFOR HQ.

MARFOR COMPONENT HQ

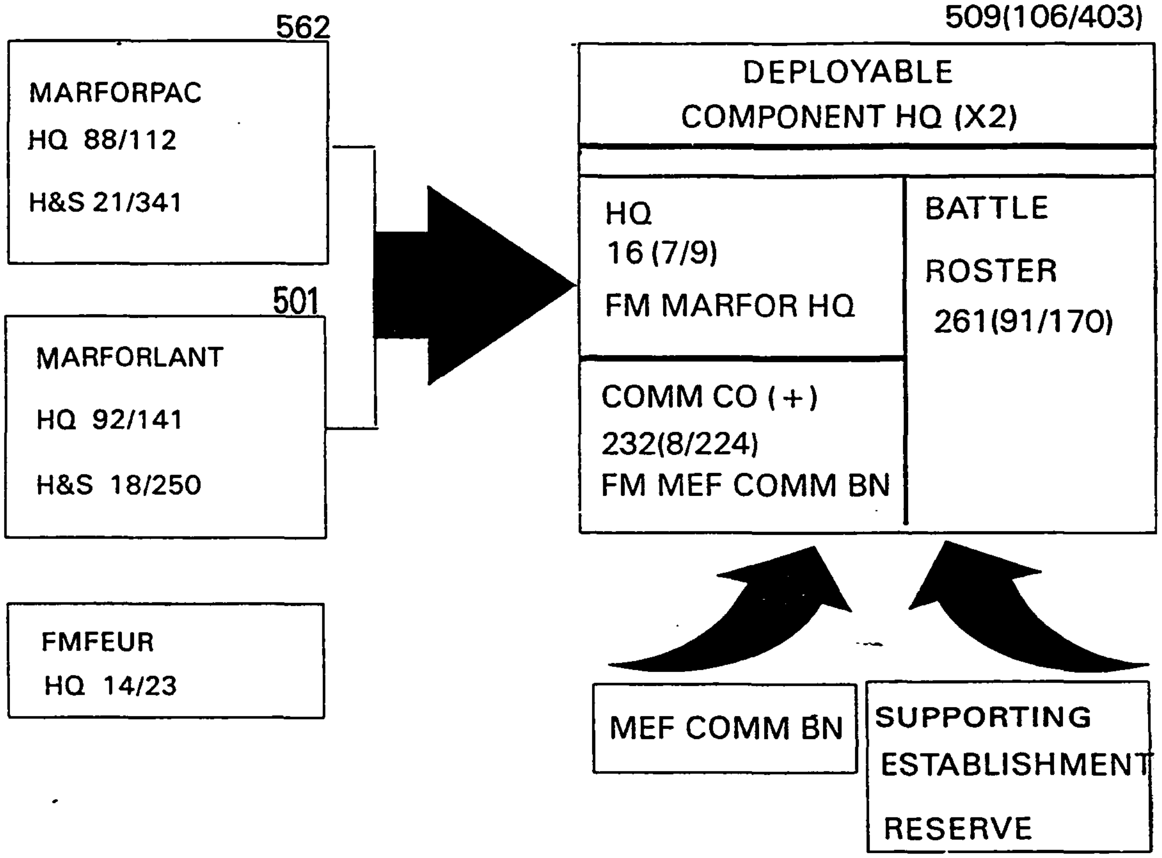


Figure 3

COMMUNICATION REQUIREMENTS - JTF

There are two main areas of concern regarding communications: JTF communications and MARFOR communications. The traditional employment concept for the Marine Corps was at the MAGTF level and communication requirements were mainly internal. In the new joint environment, MAGTF communication needs are still primarily

internal, but there is now an additional requirement for MARFOR and JTF connectivity. These new communication requirements are shown in figure 4.

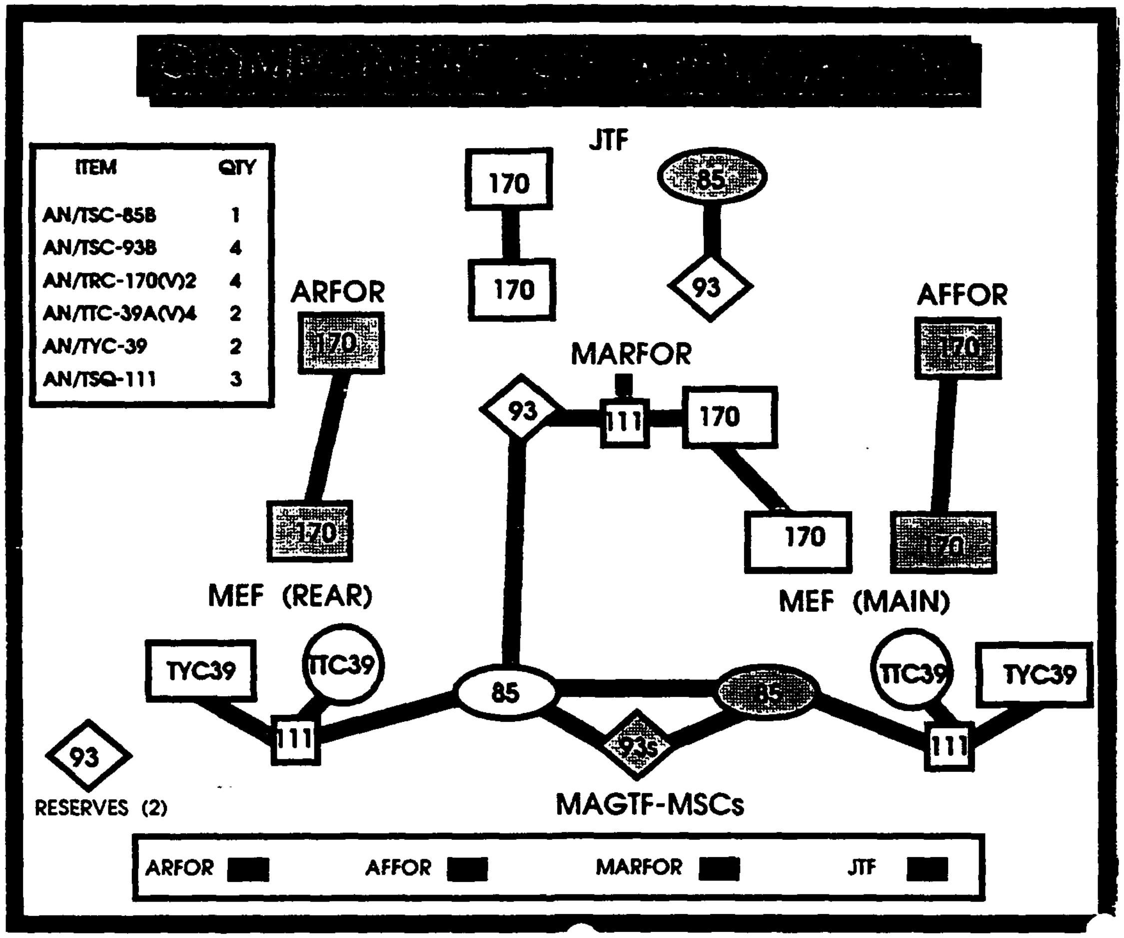


Figure 4

Operation Desert Storm validated the communications doctrine for future joint operations. The JTF's communication requirements are supported by JCS controlled assets; therefore, they are not considered to be a major problem as long as the proper procedures are followed for employing such assets. The view of Headquarters, Marine Corps (HQMC) and the JCS J-6J is that COMJTF communications

are a Commander-In-Chief (CINC)/JCS concern. (17) When a JTF is formed, either for an exercise or a real world contingency, it is the responsibility of the CINC to request the appropriate JCSE support in accordance with Memorandum of Policy Number 3, CJCS Controlled Tactical Communications Assets, dated 31 January 1990. It is the CINC's responsibility to provide CINC controlled communication assets to take over for JCSE assets should they be redeployed. If the CINC does not have the needed assets, he must request replacements from other JCS controlled communication assets via the JCS J-6.

There are several problems associated with JCSE communication support. Commanders rarely employ JCSE for exercises due to fiscal constraints. Most commanders would rather use their limited transportation dollars to get additional combat units into the exercise. For example, during the Cobra Gold 1990 exercise, the G-6 of III MEF determined that for the cost of transporting the appropriate JCSE assets from Florida to Thailand, the JTF could get twice as much communication equipment from the communications battalion in Okinawa, Japan. (17)

What happens to the COMJTF when JCSE does not perform as advertised? JTF Somalia is an example of yet another problem with relying upon JCS controlled assets. In Somalia, JCSE assets could not get in-country quickly because of air flow problems. The COMJTF simply relied upon

the communications battalion to provide the necessary communications links. This non-doctrinal employment of the communications battalion's assets is typical in real world operations. The problem increased when other JCS controlled assets arrived to replace JCSE assets. Replacement of the JTF links was not a smooth transition because these new assets were to replace JCSE assets, not provide doctrinal JTF links which 9th Communications Battalion had temporarily provided. (10)

These problems will be resolved if the CINC ensures that proper procedures are followed for requesting JCS controlled communication assets. Commanders must be familiar with these procedures to ensure effective use of JCS controlled assets in real world contingencies. The only way to get the kinks out of the system is to test it repeatedly in peacetime. Train as you would fight.

COMMUNICATION REQUIREMENTS - MARFOR

An evaluation of communication requirements shows that the biggest communication problem is at the component level. The typical employment of communications for the Marine Corps was internally focused. Marine Expeditionary Force (MEF) level operations were rarely conducted before Operation Desert Storm. Marine Corps communications focused on the division level as the largest employed unit. The development of the TTC-42 switching system is a good example

of this mind set. In 1973, the Marine Corps developed the TTC-42 which is a TRI-TAC compatible circuit switch for use at division and below. At this time, the employment of a MEF was not envisioned, and the limited switching capability of the TTC-42 was sufficient; therefore, the Marine Corps did not buy into the more expensive TTC-39 program. (2) This program would have given the Marine Corps a larger circuit switching capability. The resultant shortcoming was highlighted during Operation Desert Storm where we had to operate with MEF size units in a large joint operation. This operation also identified shortcomings in message switching systems, digital technical control systems, GMF satellite systems, and terrestrial multichannel systems.

How will the Marine Corps meet JTF and MARFOR requirements? Meeting equipment requirements is more complicated than just buying the needed assets. The communication systems required (TTC-39s, TSQ-111s, and TYC-39s) are no longer available for purchase. Even if they were available, the time involved in training operators and technicians would prevent the systems from being operational for at least a year. If we borrowed the equipment from another service, we would still have to train operators and technicians. An additional complication would be the necessity to acquire spare parts that are not currently in the Marine Corps supply system. (2) The Marine Corps must meet these communication requirements in two phases. The

first phase is to develop an immediate temporary solution.

The temporary solution developed by HQMC C4I is to develop MOAs with the Army and Air Force/Air National Guard. These MOAs request those services to provide specified communications capabilities which include equipment and personnel in support of Marine Corps operations. The use of MOAs presents the same problems as using JCS controlled assets. The Marine Corps has to pay the costs of employing these systems in an exercise for training. The Air Force MOAs involve Air National Guard units, and unless we exercise with these units, there will be no true way to evaluate their readiness. Training together is a necessity for successful component missions in real world contingencies. There is a genuine concern that in the event of a full-scale war, all bets are off in regards to the MOAs. (6) If the Air Force or Army does not live up to its MOAs, the Marine Corps will have to rely upon the ability of the CINC to provide for unforeseen equipment requirements and the generosity of other components in the JTF.

ACQUISITION OF INTEROPERABLE COMMUNICATION EQUIPMENT

In phase two, the Marine Corps must procure communication equipment that is interoperable in order to make us a full-fledged player in the joint world. This phase must be completed before the MOAs expire. The following items of equipment or their equivalent are needed:

1) TTC-39 circuit switch, 2) TYC-39 message switch, 3) TRC-170 high capacity digital terrestrial multichannel, 4) GMF equipment, and 5) a digital technical control. The Marine Corps' current acquisition plan is as follows:

1) For a high capacity circuit switch the Marine Corps is looking at a TTC-39 follow-on switch called the New Generation Switch. Marine Corps Systems Command (MARCORSYSCOM) would like to fund six of these switches for FY95 which means that the switches should arrive in the Fleet in the spring of 1997. (3)

2) The message switch plan is not as promising. There are no plans to replace the MSC-63s message terminal. HQMC decided to try to modify the current MSC-63 to perform as a message switch instead of a message terminal. Modifications will be made in three areas. First, the software must be modified to mimic the TYC-39 orbital algorithm. Second, the number of circuits must be increased from four to eight. Third, the MSC-63 must be certified to handle R and Y traffic simultaneously. The expected completion date for the first two modifications is sometime in 1996. Once these modifications have been made, the equipment must be certified for operational use. This certification process is not defined as of yet which could extend the completion date even further. (3) The Marine Corps will not have an adequate message processing capability if these modifications are not successfully completed before the MOAs

expire in 1998.

3) There are presently 134 TRC-170 V3s on order as replacement for the GRC-201 terrestrial multichannel system. If funding does not change, these systems should arrive in the Fleet in FY95. (2)

4) HQMC C4I has identified the need for two additional TSC-85 and for up to six TSC-93 GMF suites. There is no plan for procuring GMF equipment, but there is a possibility that force restructuring will free up GMF terminals around FY97. The Marine Corps needs to identify a definite solution to the GMF problem before the MOAs expire. (2 and 11)

5) The Marine Corps has decided that the Air Force TSQ-111 digital technical control facility, which requires an extensive training process, is too costly to procure. The Marine Corps has decided that procuring a portable digital technical control with limited capability or upgrading the TSQ-84 analog technical control is more feasible. There is no projected cost or fielding date for either of these projects. (3) A decision on procuring a digital technical control capability must be made now if the Marine Corps is to fully support a component headquarters and COMJTF by 1998 when the MOAs expire.

THE COMSEC MATERIAL SYSTEM (CMS)

We are all familiar with the communication problems encountered in the invasion of Grenada. Many of these problems were caused by a lack of a common communication security software package. As a result, the Intertheater COMSEC Package (ICP) was developed. This COMSEC software package is to be used by all services within a theater of operations during the initial phase of a joint operation. In order to streamline efficiency during joint operations, a common CMS management procedure is needed to manage the common software package. A common CMS management procedure was used during Operation Desert Storm when the Army established a Theater COMSEC Management Office (TCMO) for the CINC. The TCMO was responsive logistically and administratively to the cryptographic users; therefore, it prevented many of the problems experienced in Grenada from reoccurring. The Marine Corps joined the Army in manning the TCMO to benefit from this streamlined, more responsive CMS management procedure.

As the COMJTF, the Marine Corps must be capable of effectively managing a myriad of COMSEC software to include the ICP. Establishing a Marine or MEF COMSEC Management Office (MCMO) like the TCMO would facilitate the Marine Corps' ability to effectively handle the increased COMSEC software that exists when follow-on forces arrive in theater. A MCMO would provide CMS management procedures

that are common to the other services. (20)

Managing The ICP

The key to managing the ICP is proper planning prior to the operation. Unfortunately, proper planning wasn't done for Operation Desert Storm. Some Marine units failed to identify the proper amount of ICP material necessary for their use. (7 and 13) Marine aircraft were targeted by Navy, Army, and other Marine units because these aircraft could not process secure communications. These incidents were due to the lack of proper keying material (keymat). (9) Once keymat shortfalls were identified, NSA had to stop all production of future keymat in order to produce thousands of copies of effective and reserve-on-board (ROB) keymat for the units lacking the proper keymat in Southwest Asia. The Defense Courier Service (DCS) was unable to transport and deliver keymat expeditiously to Southwest Asia. Once in country, DCS was unable to locate individual units requiring the keymat. This resulted in undue logistical strains on CMS custodians and cryptographic users to locally reproduce and distribute keymat. (20)

MEF COMSEC Management Office (MCMO)

Establishing a MCMO should be standard policy for the entire Marine Corps. The MCMO should consist of a dedicated staff at the MEF or smaller MAGTFs that concentrates on CMS

matters, particularly the planning for and handling of ICP material. An advantage of the MCMO concept is that it allows the using unit to receive keymat shipments at one central point. The peacetime distribution point will be the same organization the user will use during war. Personal contacts established in garrison will continue in the deployed status. (9)

Centralized Handling Point For ICP Material

The MCMO will provide a central point for the initial storage of ICP material. The use of a centralized point will reduce the number of personnel handling the software which reduces the possibilities for compromises. Fewer compromises should occur because of smaller accounts at the smaller unit level. As an example, an infantry battalion holds multiple keymat of approximately 199 lines, which would fill approximately four two-drawer safes. If a MCMO handled ICP material, the infantry battalion would only have approximately thirty-four lines of keymat to store which would fill approximately one two-drawer safe, one fourth of the average space previously required. Lighter software loads allow the COMSEC custodians to focus on training the unit's CMS users instead of administrative paperwork. (9)

Reduced Burden On Issuing Offices And Couriers

Just as the users within a MEF will have only one

distributor of CMS software from which to coordinate shipments, the DCS, Director COMSEC Material System (DCMS), and the COMSEC Material Issuing Office (CMIO) will also have only one place to forward shipments. Without a MCMO, DCS, DCMS, and CMIO will have to deal with sixty-five units within a MEF vice the one MCMO. Coordination between the issuing offices--DCMS and CMIO--and the receiving unit MCMO, will be enhanced as the personnel in the two offices become familiar with the each other. This type of coordination would not occur if DCMS and CMIO had to deal with the sixty-five units previously mentioned. (9 and 20)

MCMO's Redistribution Capability

The MCMO will be capable of covering the mistakes of its user units. For example, if a unit does not gauge its COMSEC material needs correctly for an operation, the MCMO will redistribute the necessary COMSEC material to that unit. The MCMO will be able to redistribute COMSEC material in garrison and while deployed because it will be familiar with all the subordinate MEF units' holdings and their particular level of participation in the operation. (20)

MCMO In The Joint Environment

The single biggest reason to establish MCMOs is its ability to stand up as a TCMO or the equivalent Joint COMSEC

Management Office (JCMO). The JCMO concept is not policy for all JTFs yet, but it has been used recently in Operations Desert Storm and Restore Hope. In both operations, the JCMO concept has proven to be very worthwhile. (9 and 20) The MCMO is organized in the same fashion as the JCMO model which was developed from the Army's TCMO model. An advantage of this parallel organization is that the MCMO can establish a central point for CMS matters that mirrors the follow-on JTF and Army COMSEC management offices. (20)

The MCMO is working well in I MEF as evidenced by the success of this concept in Operation Restore Hope in Somalia. However, the remaining MEFs haven't begun employing the concept. The Marine Corps has directed the employment of the MCMO concept throughout the Corps, but no time limit for its employment has been set. (8) The Marine Corps needs to have the MCMO functioning in all command elements that may go ashore and have follow-on forces join them in theater. The likelihood of having follow-on forces is very high with the current military spirit of jointness.

DATA NETWORKS

The integration of other services' data systems is another area of concern for the Marine Corps when a MEF serves as the base for follow-on joint forces. There are two options for providing the joint data network: 1) have

the JCSE expand its role and provide the automation support or 2) have the CINC provide Deployable Automated Data Terminal Response Teams (DARTs). These teams operate a deployed World Wide Military Command and Control System (WWMCCS) site and a number of ruggedized laptops for key subordinate commands and functional elements. Option two would be more advantageous because the CINC would not have to worry about replacing JCSE assets and his staff would already be familiar with the equipment, software, and personnel associated with the DARTs. USCINCLANT has four DARTs ready for deployment. (14: 6-5)

World Wide Military Command And Control System (WWMCCS)

WWMCCS is a computer network that was developed as a result of the Cuban missile crisis to allow the National Command Authority the ability to command and control U.S. forces. However, during Operation Desert Storm, WWMCCS was used as more than just a data network for the national command. WWMCCS became the primary method in many instances for disseminating theater level information such as the air tasking order (ATO). (4)

Local And Wide Area Networks (LAN/WAN)

The primary method for passing tactical information such as the ATO should not be the WWMCCS network. During Operation Desert Storm, the ATO was passed over

the WWMCCS network to expedite dissemination because existing data networks were overloaded and untimely. This type of information should be passed over LANs and WANs. The JCS J-6 has termed joint data networks as Integrated Tactical Strategic Data Networks (ITSDNs). The Marine Corps is compatible with the other services because it has begun procuring an Internet Protocol (IP) router for its data network. The IP router is capable of interfacing with the other services' data networks to establish an ITSDN. The Air Force's inability to communicate with the joint standard interface software, X.25, creates a problem within the ITSDN. The Air Force is working to alleviate this problem. (12) Once this interface problem is fixed, the ATO can then be passed over an ITSDN. The ability to operate ITSDNs will minimize the problems of overloaded data networks.

Security For The Data Networks

Another problem in establishing an operational ITSDN is security. Security on a data network must ensure that the classified information goes only to the terminals that are authorized to receive it. There are two options the Marine Corps can use to provide the proper security for the classified data.

The first option involves systems hardware and software changes that ensure only the proper level of classified

material goes to the proper user. According to NSA, many scientists believe that the technology necessary to develop these changes is approximately ten years away. The second option is to establish separate networks for the different levels of classified information. (12) The figure below depicts the exchange of different levels of classified information.

NETWORKING VARIOUS LEVELS OF CLASSIFIED INFORMATION

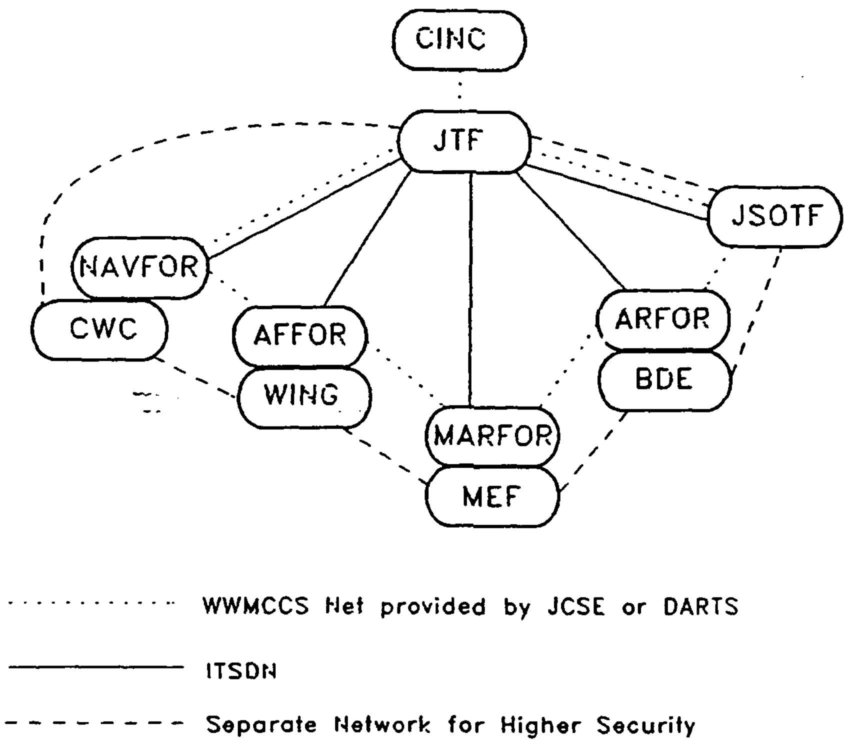


Figure 5

CONCLUSION

The Marine Corps needs augmentation in order to support the MARFOR component and the COMJTF. We have presented a method that allows the Marine Corps to support the MARFOR component with MOA augmentation and battle roster staffing. With the emphasis on joint operations, the Marine Corps must adjust to support component and discard the parochial view that Marines can do it all.

The JTF staff should consist of the personnel best qualified to perform particular staff functions. The Marine Corps' ability to train personnel for joint operations limits the number of qualified personnel available; therefore, based on qualifications, the JTF staff should be a mix of the various services' personnel.

Although there is not full agreement with regard to battle rosters, they are a viable solution to the problem of manning a component headquarters. We must put more emphasis on exercising the battle roster concept during peacetime if we expect to use it for real world contingencies. If we are not going to exercise the battle roster concept in peacetime, then we should decide upon another solution to the manning problem and train as we intend to fight.

The MOAs that are now in place are, at best, a stop-gap measure until the Marine Corps can attain the required communications equipment and train its officers and operators to function in a joint environment. We must

implement and use the MOAs, battle rosters, and JCSE in peacetime if we are going to be able to accomplish our mission as COMJTF, MARFOR, and MAGTF in a real world operation on the scale of Operation Desert Storm.

We can use the valuable lessons learned from Operation Desert Storm in regards to managing the COMSEC Material System. We recommend that all MEFs need to employ the MCMO concept as standard policy. In conjunction with procuring IP routers, the Marine Corps must continue to conduct research and development on the multilevel security program for the data networks.

In the true spirit of jointness, the Marine Corps must rely upon the other services for augmentation until we can obtain the necessary equipment and personnel required for component support in large scale operations. In the future, the Marine Corps will be able to support COMJTF and MARFOR component without relying heavily upon external support.

BIBLIOGRAPHY

1. Ahrens, P.R., Lieutenant Colonel, USMC of COMMARFORLANT. LAN interview. 23 Dec. 1992.

2. Black, D.M., Colonel, USMC of HQMC C4I. Personal interview.

3. Blaise, Major, USMC of MARCORSYSCOM. Telephone interview. 29 Dec. 1992.

4. Blankenship, Scott, Captain, USMC of MCCDC Command and Control Systems Course. Personal interview. 26 Jan. 1993.

5. Bowden, T.C., Major, USMC of JTF Somalia. LAN interview.

6. Bradley, G.R., Lieutenant Colonel, USMC of MCCDC Warfighting Center. Personal interview. 23 Jan. 1993.

7. "CMS." Marine Corps Lessons Learned System Number 91535-97213. Quantico: Ninth Communications Battalion.

8. Establishment of Marine Corps MEF COMSEC Management Offices. Message 041900Z Jan 93. Washington, D.C.: Commandant of the Marine Corps, 1993.

9. Harlan, David, Captain, and Ordonio, David, Master Gunnery Sergeant, USMC of I MEF. Briefing: "I MEF COMSEC Management Office (MCMO)."

10. Hill, R.G., Colonel, USMC of JTF Somalia. LAN interview. 24 Jan. 1993.

11. Hines, Robert, MARCORSYSCOM. Telephone interview. 29 Dec. 1992.

12. Integrated Tactical Strategic Data Network (ITSDN) Update. Message 221944Z Jan 93. Washington, D.C.: Joint Staff, J6T, 22 Jan. 1993.

13. "Inter-theater Communications Security Packages (ICP)." Marine Corps Lessons Learned Number 02141-57815. Quantico: First Marine Division.

14. Joint Interoperability and Engineering Organization. C3 Architecture for JTF Headquarters. Washington, D.C.: DIA, 1992.

15. Learn, T., Major, USMC of MCCDC Command and Control Systems Course. "Operation Tandem Thrust 92 After Action Comments."

16. Michaels, Captain, USA of US Army Signal Center. Telephone interview. 7 Jan. 1993.

17. Moberg, Harley, Colonel, USA of Joint Staff, J6J, et al. Personal interview. 13 Jan 1993.

18. Nagy, Lieutenant Colonel, USMC of MCCDC Warfighting Center. Personal interview 23 Jan 1993.

19. "The Need for AN/TYC-39 per MEF." Marine Corps Lessons Learned number 41484-39345 (00003). Quantico: CWO-2 Hurd.

20. Nicosia, Deanna L., COMSEC Manager of HQMC. Personal interview. 26 Jan. 1993.

21. Reavis, Lieutenant Colonel, USMC of MARFORLANT G-5. Personal interview. 24 Feb. 1993.

22. Simmons, Major, and Goddard, Captain, USMC of MARFORPAC "MEFEX 92-2 After Action Comments." 13 Aug. 1992.

THE RECIPE FOR THE C2 SYSTEMS OFFICER
(DON'T ADD C4I)

Submitted to Major a. Youtzy, USAF
and Mrs. Sandra Kirkpatrick
at the Communications Officers School
Quantico, Virginia

Captain M. Muckelbauer
Captain K. Palmer
Captain D. Pantaleo

United States Marine Corps

March 17, 1993

OUTLINE

THESIS: The Marine Corps must produce a C2 systems officer with the knowledge, skills and authority necessary to plan, build and manage information systems in support of the MAGTF

I. INTRODUCTION

  A. What C4I means

  B. The "C4I Officer" and what the Marine Corps really needs

II. WHY DOES THE MARINE CORPS NEED A C2 SYSTEMS OFFICER?

  A. Information systems- changing the way wars are fought

  B. The problems with information systems management

  C. The root cause of the problems

III. WHAT DOES A C2 SYSTEMS OFFICER DO?

IV. HOW CAN THE MARINE CORPS PRODUCE A C2 SYSTEMS OFFICER?

  A. The C2 Concept

    1. USMC Definition of C2

    2. The C2 model

  B. Doctrine and Education

    1. Writing better C2 doctrine

    2. Creating a C2 systems training pipeline

  C. Reorganizing the Staff

    1. The G-6 as the single systems manager

    2. Empowering the G-6

    3. Creating the "SSU"

V. CONCLUSION

THE RECIPE FOR THE C2 SYSTEMS OFFICER
(DON'T ADD C4I)

One of the preeminent command and control buzzwords to emerge over the last decade is "C4I." To many, "C4I" implies communications technology. To others, the term goes beyond communications technology, encompassing the integration of many disciplines that affect command and control. The Marine Corps has embraced the term "C4I" without clearly defining its precise purpose. The Marine Corps has created several organizations under the C4I umbrella over the past six years as well (7). How can the Marine Corps be sure the designed goals of these initiatives are being met if C4I has never been defined?

In reality, the Marine Corps has mired itself in what Thomas Coakley calls a "terminological thicket (3:9)," perpetuating the use of a dysfunctional term. Though it has evolved into something larger, "C4I" originated in the Department of Defense for budgetary reasons (3:44), and was introduced into the Marine Corps lexicon by a group of Marine officers as a shorthand for select operational aspects of command and control (18). In reality, C4I is not a concept. It is an acronym for functions, whether similar or dissimilar, that relate to command and control.

Recently, a group of senior Marine officers voiced the need for a "C4I Officer (16)." Assigning an officer the responsibility for C4I, though, is impossible since C4I has no meaning. However, the Fleet Marine Force (FMF) organizations created under the C4I umbrella and the "C4I Officer" initiative are aimed at correcting a real and much ignored problem: the need to assign singular responsibility for communications and computer networks in the MEF to one officer. Presently, the responsibilities for information systems in a MEF are diffused through several staff sections and subordinate commands. If the Marine Corps ever plans to capitalize on the capabilities information systems offer, it should place the responsibility for C2 systems in the hands of one manager. Therefore, *the Marine Corps must produce a C2 Systems Officer with the knowledge, skills and authority necessary to plan, build and manage command and control systems in support of the MAGTF.*

WHY DOES THE MARINE CORPS NEED A C2 SYSTEMS OFFICER?

Operation Desert Shield/Desert Storm provided a glimpse of how current information systems technology has influenced the battlefield. The capabilities of information systems have changed the behavior of U.S. military organizations,

reshaping the traditional processes by which operations are planned and forces managed in battle (10:35). From the Air Force's Joint Surveillance and Target Attack Radar System (JSTARS) to the local/wide area networks employed by the Marine Corps, information systems were key tools in the planning and operational process.

For Marine Forces Central Command (MARCENT), computer systems provided the staffs an unprecedented ability to analyze, collate and fuse information. However, the communications architecture which supported these systems was insufficient. Pipelines were either too large or too small, resulting in backups or stoppages. And with little thought to economy and efficiency, numerous independent computer systems were employed to support information requirements. These systems were not interoperable, and many could not interface with the common user communications architecture of MARCENT (16).

The root cause of these problems was the lack of one single MAGTF systems manager (9). Major subordinate commands (MSCs) owned pieces of the overall system, and each command operated that piece to support its own priorities. This incongruent effort severely degraded the overall interoperability and efficiency of the system. Also, the MAGTF general and special staff sections, instead of

articulating information requirements, dictated specific hardware requirements (16). By fixating on hardware requirements instead of *information* requirements, the staff sections also disregarded interoperability and efficient use of the communications available. The problems engendered by each organization wanting its own "piece of the pie" resulted in critical data not going to the appropriate place, or organizations besieged with too much information. These problems rightfully precipitated the need for a *C2 Systems Officer*.

WHAT DOES A C2 SYSTEMS OFFICER DO?

Many senior officers have recognized the problems. There have even been some proposed solutions, most notably the "C4I Systems MAGTF Planner" MOS being instituted this year (23). However, none of the proposed solutions go far enough. While a "C4I Systems MAGTF Planner" will plan, coordinate and monitor (12), the Marine Corps needs an officer capable of planning, coordinating, and *supervising* C2 systems support. The ideal C2 Systems officer will:

(a) Understand the concept of command and control, and how uncertainty affects all aspects of war (16);

(b) Understand the principles of combined arms operations and MAGTF warfighting, both at the operational and tactical level of war (16);

(c) Plan and build information systems which marry into the doctrine of MAGTF warfighting, at both the operational and tactical levels (16);

(d) Understand the doctrinal responsibilities of the other staff sections and the capabilities of subordinate commands, to ensure systems are used to enhance, not degrade, operations (16);

(e) Understand the technical characteristics of all information systems used within the Marine Corps and the joint arena, to assimilate and integrate these systems into the existing structure (16);

(f) Have the authority necessary to integrate all systems supporting the MAGTF into a single system, and to manage that system.

HOW CAN THE MARINE CORPS PRODUCE A C2 SYSTEMS OFFICER?

Because of the impact information systems have made on the Marine Corps' ability to plan and manage battle, creating a C2 Systems Officer requires more than assigning an additional MOS or changing a billet name and Table of Organization line number. Changes such as these are superficial. To make the concept work, the Marine Corps must first build a conceptual framework of command and control, decide where this officer fits in, incorporate this concept into doctrine, and reshape the current staff responsibilities in light of 20th century technology. The entire process

can be broken down into three incremental steps:

(1) Building the conceptual framework for command and control, articulating how information systems support this concept, and publishing doctrine to promulgate this information;

(2) Educating potential C2 Systems Officers;

(3) Restructuring traditional staff responsibilities to establish a "C2 Systems Officer" billet. The C2 Systems Officer will be the single manager for the MAGTF C2 system.

The C2 Concept

The Marine Corps has no standard definition of command and control (18). Different commanders define the term differently. This lack of a consistent C2 philosophy results in divergent command post configurations, inefficient communications architectures and ineffective staff functioning (24). Consistency, however, is vital in ensuring the Marine Corps easily integrates with joint and combined task forces. Therefore, the Marine Corps needs a common conceptual framework of C2 based on our own warfighting philosophy (10:61).

There are few resources available for constructing such a framework. The JCS Pub 1-02, one resource, defines C2 as:

> The exercise of authority and direction by a properly designated commander over the assigned forces in accomplishment of the mission. Command and control functions are performed through an arrangement of personnel, equipment, communications, facilities and procedures employed by a commander in planning, directing, coordinating

> and controlling forces and operations in the accomplishment of the mission. (21:1-16)

While the phraseology provides a starting point, JCS Pub 1-02 describes C2 more than it defines C2. Lacking in this definition is a focus of application; it fails to answer the question "What does command and control do?" The definition provides no end state beyond "accomplishing the mission," which is an over-used phrase the military relies upon when dealing with a complex issue. Of course command and control assists in accomplishing the mission. Everything the military does should be directed at accomplishing the mission. But command and control, especially to reinforce the Marine Corps philosophy of warfare, must be defined in a manner which provides an insight into not only how it should function, but its specific responsibility in accomplishing the mission.

Martin Van Creveld's insights on command and control illuminate the Marine Corps philosophy of warfighting. In Command In War, he states that command and control is simply the commander's means of dealing with uncertainty. He further states that despite the sophistication of any system, uncertainty will always be a factor in war because of the intangible elements involved: opposing wills, strong emotions, and the human thought process (18:264).

The tenets listed in the Marine Corps publication Warfighting mirror Van Creveld's theories. Both emphasize the inescapable elements of friction and uncertainty in warfare, echo the need for decentralized command and low decision thresholds, and frame the concept of C2 in the same manner: *as the process a commander uses to deal with uncertainty* (18, 27).

Brigadier General P. K. Van Riper is generally regarded as one of the few C2 experts in the Marine Corps. Using Van Creveld's C2 concept as a foundation, Brigadier General Van Riper developed a graphic model depicting how a philosophical base, supporting the five key elements of command and control, bolster effective C2.

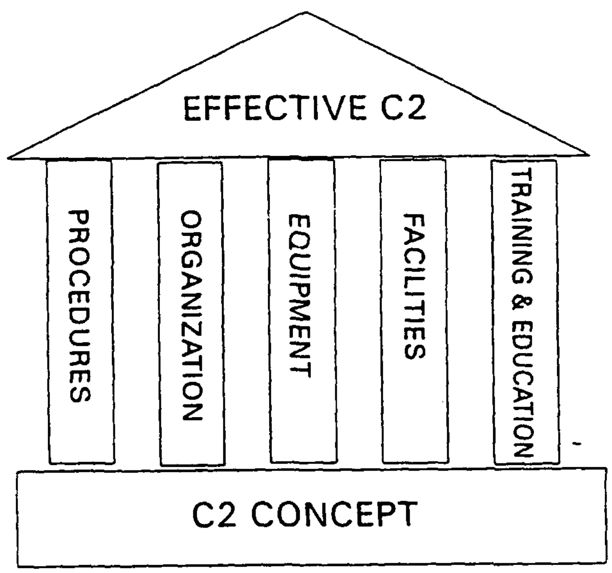


Fig 1: BGen Van Riper's model of C2

The 5 pillars of Brigadier General Van Riper's model, (procedures, organization, equipment, facilities, and training/education), rooted in a common philosophy of C2, must be in place before an organization can achieve effective command and control (19). Brigadier General Van Riper's model applies to all facets of Marine Corps organization, and to all aspects of command and control.

We have developed the model one step further, dividing the pillars into two horizontal layers representing the hierarchical arrangement of functions involved in C2.

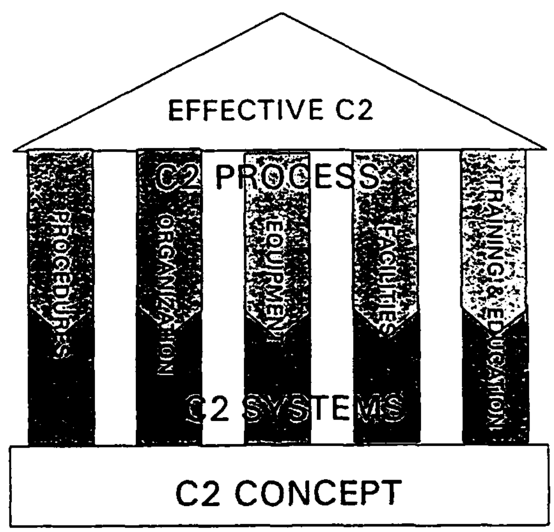


Figure 2: Refined C2 Model

The uppermost layer represents the functions of the staff and the commander. This layer is responsible for staff organization, command post organization, the operations order, intelligence, etc. The bottom layer represents the supporting functions of information systems. This layer is responsible for LAN/WANs, switched backbone networks, single channel radio systems, secondary imagery dissemination systems, etc.

The first layer can be termed the command and control "process" (3:17) since it incorporates the "human elements of command (27:62)." The second layer can be termed the command and control "system," since it incorporates the technological aspects of command and control. *C2 systems support and enable the C2 process, which in turn supports and enables effective command and control.*

All five pillars are required to support each of the two functional divisions; each functional division is required to support effective command and control. The functional layers can be defined as follows:

C2 Process - the concept involving the focusing of staff and subordinate functions towards the goals established by the commander. Again, *the C2 process serves as the enabler for command and control.*

C2 Systems - the integration of communications, computers and associated technology into a functioning, cohesive system designed to support the C2 process (20). *A C2 system serves as the enabler for the C2 process.*

These terms describe the implicit interaction of each layer required for effective command and control. The model also allows the Marine Corps to avoid the term "C4I." While the concept behind "C4I" equates to C2 systems, the term muddles the issue.

We recommend the Marine Corps adopt the refined model of C2. First, the model emphasizes that systems support the process. All C2 systems must be designed to assist the commander and staff in dealing with uncertainty. Second, the model emphasizes that the C2 process depends on the C2 system. The system supports information flow, allowing the process to fuse the information into a usable form. Third, it accurately depicts the need for those involved in the C2 process to be aware of the **capabilities** of the C2 system. Moreover, those who manage the C2 system must be aware of the **requirements** of the C2 process.

C2 Doctrine and Education Requirements

Upon establishing this conceptual base, the next step is to develop corresponding doctrine. This step is vital; doctrine offers the best means for effectively standardizing a philosophy of command and control (19). Doctrine also provides the foundation for future success on the battlefield. The U. S. Army realized the importance of doctrine when it acquired the Apache helicopter:

> The successful use of Apache helicopters during Desert Storm required a tactical concept integrated with AirLand Operations doctrine, a corps of expert operators and commanders trained in their employment, a fully developed logistics support structure, and the right mix of technology on the aircraft itself...The helicopter was not a complete weapon until the doctrine, procedures and other technology...were fully integrated...The same process must be observed for [C2 systems]. (10:40)

A series of publications, articulating the Marine Corps philosophy of command and control (and the elements which support this philosophy) must be produced. The following publications are needed:

(1) A centerpiece publication which describes the fundamental operational concepts of employing MAGTFs. This document should be written in the same simple and direct manner as FMFM-1.(20)

(2) A series of supporting publications which explain in greater detail operational concepts of employment of the MAGTF.(20)

(3) A series of publications focused on the concepts of C2 which can be applied to all echelons of command. Included in this series are publications of MAGTF C2, GCE/ACE/CSSE C2, C2 support and command and staff action.(24)

(4) A series of MAGTF SOPs which spell out the responsibilities for various functional areas. Examples are intelligence, fire support coordination and command post operations.(20)

Once this doctrine is published, the Marine Corps will have a solid foundation for educating future commanders and C2 systems officers. While a draft publication about command and control (FMFM-3) has been published, it misses the mark. Though it contains a good deal of important information, the publication is too unwieldy to be read and understood. It should be restructured and simplified to match the requirements listed above.

The Marine Corps' educational structure must be revitalized as well. While the Marine Corps is presently providing more C2 training than the other services, more needs to be done (8,16). An incremental C2 and C2 systems training process should be established from NCO school to the Marine Corps War College. As General Gray wrote,

> We cannot rest on our laurels. To maintain momentum, you must take a proactive role. Educate and train- instill the [C2 systems] concept into your Marines until it becomes the only way of thinking with regard to the effective integration of all command and control assets to support the commander (7).

This training process must take two separate paths which diverge and converge at distinct points during a Marine's career. One path must be dedicated to training future commanders and staff officers responsible for the C2 process. The second path must be dedicated to training Marines to design and build C2 systems. Officers whose MOS necessitates focusing on information systems technology (2502, 4002, 7208 and 7210) should be assigned to the "systems path." Most other MOS's should take the "process path." Some disciplines, such as intelligence, signals intelligence and air defense can benefit from either path.

Key in this training model is the fact that the C2 process and C2 systems are required to *function in consonance* to support effective command and control. Many Marines involved with C2 systems become too preoccupied with the systems and forget who and what the systems support. Likewise, Marines involved in the C2 process often regard systems as a crutch for intuition and depend too heavily on the systems (14). If C2 systems are the nervous system for the MAGTF, the C2 process is the brain. The poorly functioning brain can misdirect the nervous system, causing the nervous system to overload. Likewise, a faulty nervous system may cause the brain to be ineffective by blocking essential information. Thus the "process" and "systems" pipelines must be mutually supportive.

C2 systems training must prepare Marines to employ information systems on the battlefield to support the commander. To meet this goal, the C2 systems officer cannot afford to be just a communicator or just a computer expert. Instead, the C2 systems officer must be a *systems* expert, able to integrate communications and computers into one system aimed at getting the commander the information he wants. Also, the C2 systems officer must understand the doctrinal employment of the MAGTF and the information requirements of staff sections within the MAGTF (9,16). This portion of the C2 systems officer's education is vital, for it will help the C2 systems officer understand the **process** he supports. Figure 3 depicts the overall training pipeline.

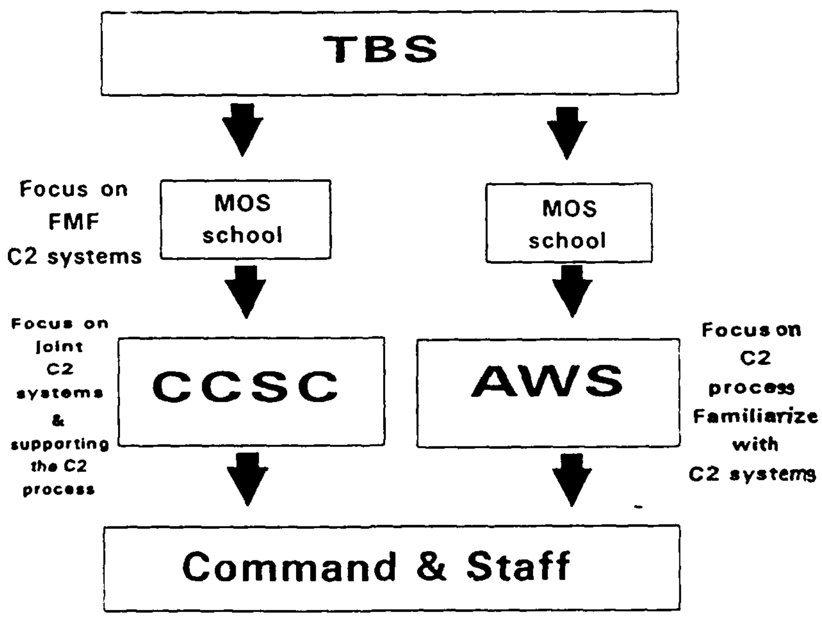


Figure 3: C2 Training pipeline

Specific information regarding a C2 systems pipeline we propose can be found in Appendix 1.

In regards to both training pipelines, the importance of the commander's role in both the C2 system and the C2 process must be constantly underscored. "C2 training is not just for the specialist," noted Brigadier General Van Riper, "but for the specialist **and** those who aspire to command. (19)." FMFM-3 does underscore this last point:

> ...commanders must understand the whole C2 picture with all its moving parts, how the parts interrelate, and the strategies involved in focusing and balancing the C2 resources in order to gain the operational and tactical advantage. (22:1-1)

The final product of these training pipelines will be officers skilled in the employment of information systems in support of the MAGTF, and commanders who understand the system which supports them.

Reorienting Organization

The final step in creating the C2 systems officer is to reorganize the MEF command element and create a single systems manager. Current responsibilities for planning, building and managing information systems are spread through several staff sections and organizations (9). Figure 4

depicts the current disarray of C2 systems responsibilities. Because system responsibilities are divided based upon the function of each staff section and organization, there is no "seamless" architecture.

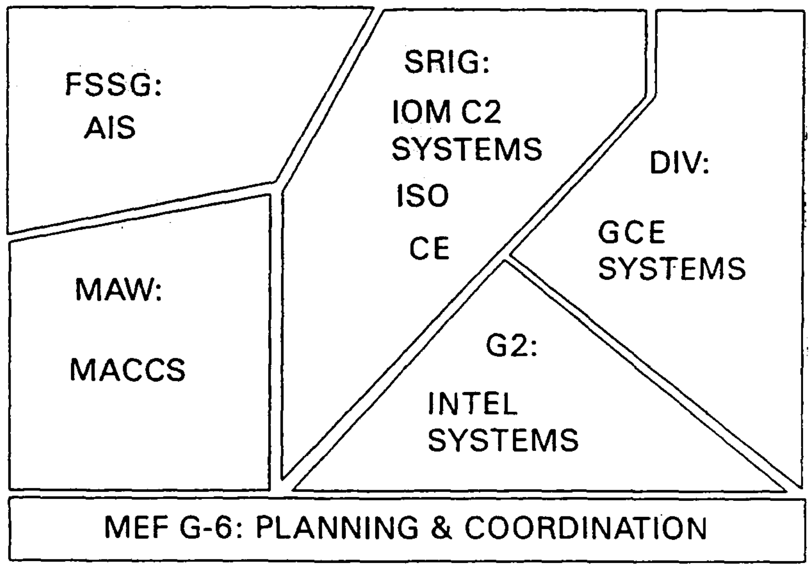


Figure 4: Current C2 Systems Responsibilities

The systems manager must have the authority to manage the entire MAGTF architecture. This authority must transcend traditional organizational boundaries. But which individual should be so empowered? Currently, there is no consensus. Colonel Floom, Commanding Officer of the 2d SRIG, commented:

> ...the CO of the SRIG must have overall responsibility for building the commander's [C2] system. He should also be the G-6 and have planning responsibility for [C2 systems]. All the people that work systems in the G-2, G-3 or any other staff section should also be a part of this organization (6).

Brigadier General Van Riper views the concept differently; he contends the responsibility for C2 systems should be divided among a commander's staff (19). Major General Jenkins, the current director of C4I, takes General Van Riper's contention even further and states that the G-6 should be the only C2 systems officer (9).

Each point of view is valid in certain respects. Making the SRIG commander the MEF C2 systems officer, however, offers more disadvantages than advantages. The SRIG commander would be less attuned to the operating requirements of the general staff than a member of the general staff. In addition, the CO of the SRIG has enough to do as a commander without being saddled with the burden of being staff officer as well.

Dividing the responsibilities for systems among a staff also causes problems. Operation Desert Storm proved that this concept does not work. Therefore we recommend the overall systems manager be the G-6.

The G-6, however, does not have the doctrinal authority to be the C2 systems officer (9). Currently, the G-6 runs a planning agency. While the G-6 is often held accountable for how well the MEF C2 system works, he lacks the overall authority to modify the system. To correct this, the Marine Corps must reorient its staff structure, so that the G-1,

G-2, G-3, G-4 and G-5 manage the C2 process, and the G-6 manages the C2 system.

This involves refocusing the attention of the staff away from hardware requirements towards *information* requirements. Each staff section will provide these information requirements to the G-6. The G-6 will then translate these information requirements into hardware, software and communications requirements, and plan the system accordingly. While the G-6 becomes the manager of the C2 system, the other staff sections become facilitators of information (9). The G-6 must keep in mind, however, that each staff section using the system must know the operational parameters of the system. The G-6 will have to continually train and retrain the remainder of the staff about the capabilities and operations of the latest systems fielded. The greatest technological capabilities in the world are useless when Marines do not know how to use them.

The G-6's authority as the C2 systems officer must apply to the entire MEF. Switched backbone systems have made the old "higher to lower, adjacent as required" systems hierarchy largely irrelevant. On today's battlefield, a circuit may pass through a number of nodes before reaching its final destination. Also, the operation of each node in a C2 system depends on the operation of other nodes; each part of the

system is interdependent on the remainder. Management of the system must be centralized for the system to work correctly. Currently, the MEF G-6 depends on the benevolence of subordinate unit staffs and commanders to function as the centralized manager. Since most of the equipment comprising the network is owned by subordinate commands, the MEF G-6 has little recourse but to operate this way.

To correct this, the G-6 must be able to pool the equipment and personnel necessary install, operate and maintain the entire network, creating a "Systems Support Unit (SSU)". The SSU will be a temporary organization, made up of the assets available in the SRIG and the MSCs. The mission of the SSU will roughly equate to area information systems support: providing the lateral and higher to lower connectivity necessary to support the command element and each major subordinate command. The MEF G-6 will serve as the operational commander of the SSU.

The equipment and personnel mix of the SSU must be balanced between the focus of the MEF as a warfighting organization and the operational requirements of the MSCs. With this criteria in mind, the G-6 will submit the proposed organization of the SSU to the MEF Commanding General for approval. While some commanders may balk at the thought of losing equipment and personnel to the command element, this

method of operation will ensure more efficient and reliable connectivity. The technology currently in use necessitates centralized management of the communications network. This concept will also ensure that the MAGTF architecture is primarily responsive to the principle warfighter: the MEF commander.

Through the SSU, the MEF G-6 will have the resources to build the MAGTF information systems architecture, attuned to the focus of the **MAGTF** while still responsive to the requirements of the MSCs. Task organization will be the principle behind the SSU structure. The Marine Corps has task organized for decades; forming an SSU will be much more efficient than creating a new, permanent organization. Similar concepts worked for the commander of the 8th Communications Battalion during Desert Storm (1); there is no reason the concept will not work in the future.

To effectively manage an entire network, the MEF G-6 will require assistance from the staffs of the FSSG ISMO section and the Communications Battalion. [To avoid too many cross attachments, a majority of the FSSG ISMO section should be moved to the SRIG, creating a "data company" to support the MAGTF. (12)] The MAGTF G-6 section will also have to grow from 6 officers to 10 to ensure the necessary expertise resides internal to the staff. However, the additional

bodies will come from either the MEF or through "battle roster" augmentation. Appendix 2 lists the recommended organization of the MEF G-6 section; Appendix 3 suggests a notional composition of an SSU and recommended doctrinal responsibilities in regards to systems management.

The responsibilities of the SRIG and subordinate G-6 section will change accordingly. Subordinate G-6 section heads will also be the sole systems managers within their respective commands. However, their scope of responsibility will be limited to the systems which support only their headquarters; nodes within the network will still fall under the purview of the MEF G-6. While a portion of their system resources may belong to the MAGTF, the MSC G-6 will still be busy coordinating support with the command element and employing remaining assets in support of the MSC mission. The SRIG will become strictly a supporting command, providing trained and equipped C2 systems units to the MAGTF and MSCs.

The G-6 of a MEF Forward or the S-6 of a MEU will also serve as the principal C2 systems officer. While single channel radio normally serves as the primary C2 system of a MEU, there are cases where the MEU S-6 may have to exercise his authority as the sole systems manager. A MEF Forward, on the other hand, normally deploys with a wide array of C2 systems. Having the MEF Forward G-6 serve as the MAGTF

systems manager will make expanding the MEF Forward into a full MEF easier, since the MEF Forward G-6 can task organize his SSU to support the added connectivity required.

CONCLUSION

Once this "C2 systems concept" is fully implemented, the Marine Corps will be better able to exploit the capabilities of our C2 systems. As a warfighting headquarters, the MEF requires the ability to direct the application of <u>all</u> resources, including C2 systems. Currently, the MEF command system is broken because it has been divided among too many entities. Implementing the C2 systems officer concept will fix what is wrong. However, this concept must be implemented in total, including:

(a) Establishing a philosophical base for command and control which supports the Marine Corps philosophy of warfighting;

(b) Incorporating this philosophy into doctrine;

(c) Refining the education system to ensure C2 systems officers have the technical and tactical knowledge necessary;

(d) Reorganizing the MEF staff to support the efficient employment of C2 systems.

Without each element, this C2 systems officer concept will not work. As Martin Van Creveld stated,

> Establishing a separate category called "command system," separated from all other components which make up the armed force, is no doubt an indispensable step towards understanding. Unless extreme care is taken, however, that very step will introduce an element of distortion and thus risk defeating its own purpose.(18:263)

APPENDIX 1

Proposed C2 Systems Training Pipeline*

The primary purpose of this training pipeline is to produce officers capable of assuming the duties of the MEF G-6 (C2 Systems Officer). This appendix will focus on the occupational specialties normally associated with MEF information systems: 2502 (communications) and 4002 (data processing). While other MOS's can be considered as "C2 systems specialties," (2602, 7208, 7210) officers with these designators rarely have the opportunity to gain the operational experience necessary to be a MEF G-6.

The current training pipeline has officers first attending either the Basic Communications Officers Course (BCOC) at the Communications Officers School, or the Data Systems Officers Course at the Computer Sciences School. The first step in refining the C2 systems training pipeline must be to combine the curriculum of these two schools, creating a "Basic Data Communications Officers Course (BDCOC)." DMRD 918 has effectively put the Marine Corps out of the mainframe processing business; separate data

---

*Captains T. Hall, J. Davis and D. Gran provided information regarding this training pipeline. While it is beyond the scope of this appendix to provide detailed information, their paper is dedicated to the specifics of C2 systems education.

systems/communications occupational specialties are no longer required (13). Also, technology has blurred the distinction between the disciplines. To best support the information requirements of our operating forces, the two MOSs should be combined.

The primary mission of the BDCOC will be to train lieutenants to be battalion S-6 officers and platoon commanders in the Communications Battalion, Division/FSSG Communications Company, or Wing Communications Squadron. The course must be oriented at providing the necessary theoretical and doctrinal instruction to teach lieutenants operating characteristics of the C2 systems currently employed, and how these systems are used to support the C2 process. BDCOC should be organized into seven distinct subcourses, addressing the following areas:

MAGTF Command and Control Process

*The definition and focus of Marine Corps C2

*MAGTF organization

*Staff functioning

Introduction to Data Communications

*Communications theory

*Basic electricity

Tactical Switched Backbone Systems

*Installation and operation of transmission equipment (GMF/troposcatter/UHF multichannel equipment)

*Digital switching equipment (ULCS) installation and operation

*How to plan a switched backbone system

Tactical Single Channel Radio (SCR) Systems

*Operation and characteristics of FMF SCR equipment

*Line of sight/HF planning

*SCR procedures

*FMF radio nets

Tactical Microcomputer Systems

*Computer characteristics and operations

*FMF software applications

*Computer to computer communications

*LAN/WAN planning and installation

*Mainframe computer support

Information Systems

*Planning an information systems network

*MAGTF information systems architecture

*FMF C2 systems organizations

Expeditionary/Amphibious Operations

*How C2 systems are applied in amphibious and expeditionary environments

The next step in the training pipeline for C2 systems officers is either the Naval Post Graduate School (majoring in C2 systems) or the Command and Control Systems Course (CCSC). The Communications Officers School is far ahead of any of the other service's career level schools in providing C2 systems training. The curriculum, however, has room for improvement. CCSC should educate vice train- teaching officers how to apply systems to best support the command and control process at the Marine Expeditionary Force (MEF) and Joint Task Force (JTF) level.

To accomplish this, the course must first focus on the information need lines inherent in a MEF or JTF. Thus the first half of the course should focus on the "process" aspect of command and control. The second half of the course should focus on instilling the thought process needed to employ information systems in support of a MEF, Marine component or JTF commander. CCSC should be organized into 9 subcourses, addressing the following areas:

C2 Process

*Functioning of a MAGTF staff

*Commander's information requirements

*The operational planning process

Combined Arms Operations

*Marine Corps philosophy of warfighting at the tactical and operational levels of war

*Combined arms doctrine

*Supporting arms coordination

*Marine Corps intelligence process

*Employment and capabilities of the Marine Division

Air Combat Element Operations

*Employment and capabilities of the Marine Air Wing

*Air Force employment and capabilities

*Integrated air defense systems

*Command and control of air forces

Combat Service Support/Logistics Operations

*Combat service support planning

*Logistics requirements of Marine and joint forces

Expeditionary/Amphibious Operations

*Employment of a MAGTF across the full spectrum of conflict

Joint Operations

*How JTFs are organized

*Capabilities of each JTF component

*The role of the Department of Defense in national policy

*Unified/specified command organization

C2 Systems

*Characteristics, operation and employment of the Marine Corps and joint inventory of C2 systems

*Planning a C2 systems architecture for a MEF

*Navy C2 systems

*Joint C2 systems connectivity

Strategic C2 Systems

*Department of Defense C2 agencies

*Department of Defense C2 systems

*Strategic C2 systems architecture

*How to access strategic systems

The final subcourse of the school, "Systems Integration," will be used to evaluate the student's ability to plan and build an integrated information system in support of the Marine Corps component of a JTF

ALMAR 050/093 has stipulated that graduates of the CCSC be assigned the additional MOS of "MAGTF C4I Systems

Planner. (23)" It is our recommendation that the MOS be awarded after achieving the rank of major, in order to provide graduates of the CCSC an opportunity to apply what they have learned in the fleet. By waiting until officers reach the rank of major, the Marine Corps will ensure that only the most qualified officers serve as a MEF C2 systems officer.

The final level of schooling for C2 systems officers will be the Command and Staff College (or similar level sister service school). No additional specific C2 systems education should be necessary. Command and Staff College is a necessary merging of officers who have taken the C2 systems training pipeline or the C2 process pipeline. The Command and Staff College provides a common perspective of Marine Corps warfighting for future staff officers and future commanders. This step is as crucial as the previous two, for without this common perspective, the C2 systems officer will be prone to focusing only on C2 systems, and not on the process which the systems support.

APPENDIX 2

PROPOSED MEF G-6 TABLE OF ORGANIZATION

The current MEF G-6 staff is not large enough to support the G-6 in his role as the C2 systems officer/MAGTF systems manager. The G-6 should be organized into 5 sections- a headquarters section, a plans section (provides the personnel necessary to plan future operations), an operations section (monitors the system currently in place) and an administrative section and an electronics maintenance section.

Billet	Grade/MOS	Duties
HEADQUARTERS SECTION		
G-6	Col/9906	C2 Systems Officer
Dep G-6	LtCol/9985	Asst C2 Systems officer
Clerk	Sgt/2549	
Clerk	LCpl/2542	
PLANS SECTION		
Plans Officer	Maj/9985	Plans for future systems employment at the joint/MEF level
Asst Plans Officer	Capt/2502	CCSC graduate
Plans Chief	MGySgt/2591	Assists plans officer
Special Systems Officer	Capt/2602/0202 (CCSC graduate)	Plans for employment of intelligence systems
Frequency Manager	GySgt/2591	
Plans Clerk	LCPL/2542	

OPERATIONS SECTION

Operations Officer	LtCol/9985	Serves as the systems control officer for the MEF C2 system
Asst Ops Officer	Major/9985	Assistant systems control officer
Network Officer	Capt/2502/4002 (CCSC graduate)	Provides technical guidance to Ops officer regarding systems integration
Network Officer	Capt/2502/4002 (CCSC graduate)	
Special Systems Officer	Capt/0202/2602 (CCSC graduate)	Manages intel systems
Operations Chief	MGySgt/2591	
Network Chief	MSgt/2591	Assists Network Officer
Network Chief	MSgt/2591	
Computer Support Chief	GySgt/4062	Provides technical expertise regarding tactical and mainframe computer employment
Software Support Chief	GySgt/4062	Provides technical expertise regarding computer software applications

ADMINISTRATIVE SECTION

Cryptographic Support Officer	Capt/9910	Provides MEF level CMS management, and technical guidance regarding crypto hardware employment
Cryptographic Support Chief	GySgt/99XX	Assists CSO

Clerk	Sgt/2549	
Clerk	Cpl/2542	
Clerk	LCpl/2542	

MAINTENANCE SECTION

Maintenance Officer	Maj/2802	Provides electronic maintenance guidance to the G-6
Maintenance Chief	MGySgt/2591	
MIMMS Clerk	Cpl/0411	

The special systems officer in the Operations section will come from the G-2 staff. The Plans section will not be filled unless the MEF deploys. Then the plans section will be filled via the "battle roster" concept.

I MEF, under Lieutenant General Johnston, has submitted a change to the Table of Organization of the G-6 section of the MEF command element (25) similar to the one proposed here. The main difference lies in the lack of an ISMO section in our recommended organization. We believe that the capability to plan and integrate computers into the information systems network should be inherent in both the planning and operations sections. We believe having **separate** ISMO section inhibits acceptance of computers and computer systems as just another part of the overall information systems architecture.

APPENDIX 3

NOTIONAL SSU ORGANIZATION/ PROPOSED DOCTRINAL SYSTEMS MANAGEMENT RESPONSIBILITIES

1. Notional SSU. Below is a notional organization for a Systems Support Unit (SSU). The SSU should be organized for each specific MEF mission; the organization listed below is simply a model to show what types of organizations may make up the SSU.

Notional SSU

Unit	Composition
Det, SRIG	All or part of the Communications Battalion
Det, FSSG	The DRASC and associated personnel; a detachment of the Electronic Maintenance Company; the entire FSSG ISMO section (again, the majority of the FSSG ISMO section should be moved to the SRIG to better support the MEF)
Det, MWCS	8 AN/TRC-170, 1 AN/TTC-42, 12 AN/MRC-142, associated personnel
Det, Comm Co., Division	2 PLRS Master Stations, 1 AN/TTC-42, 4 AN/MRC-142, associated personnel

2. Proposed Systems Management Responsibilities

The G-6 section alone will be unable to provide adequate manpower to effectively manage a MEF level network. Therefore, the G-6 must be able to efficiently delegate portions of that responsibilities to units within the SSU. This "organization for management" must be carefully planned to capitalize on the expertise inherent to the units within an SSU while ensuring the MAGTF network is not divided into portions that are managed independently. Below is one possible systems management structure:

Network Operations Center (NOC)

The primary management agency. Staffed by the MEF G-6. Responsible for:

*Overall coordination and operation of the MEF C2 systems network
*Planning future requirements in support of the MEF

Network Control Center

Subordinate to the NOC. Staffed by the Communications Battalion.
Responsible for:

*Systems/technical control of the MEF communications network
*Planning to fulfill the missions assigned by the NOC

Mainframe Operations Center

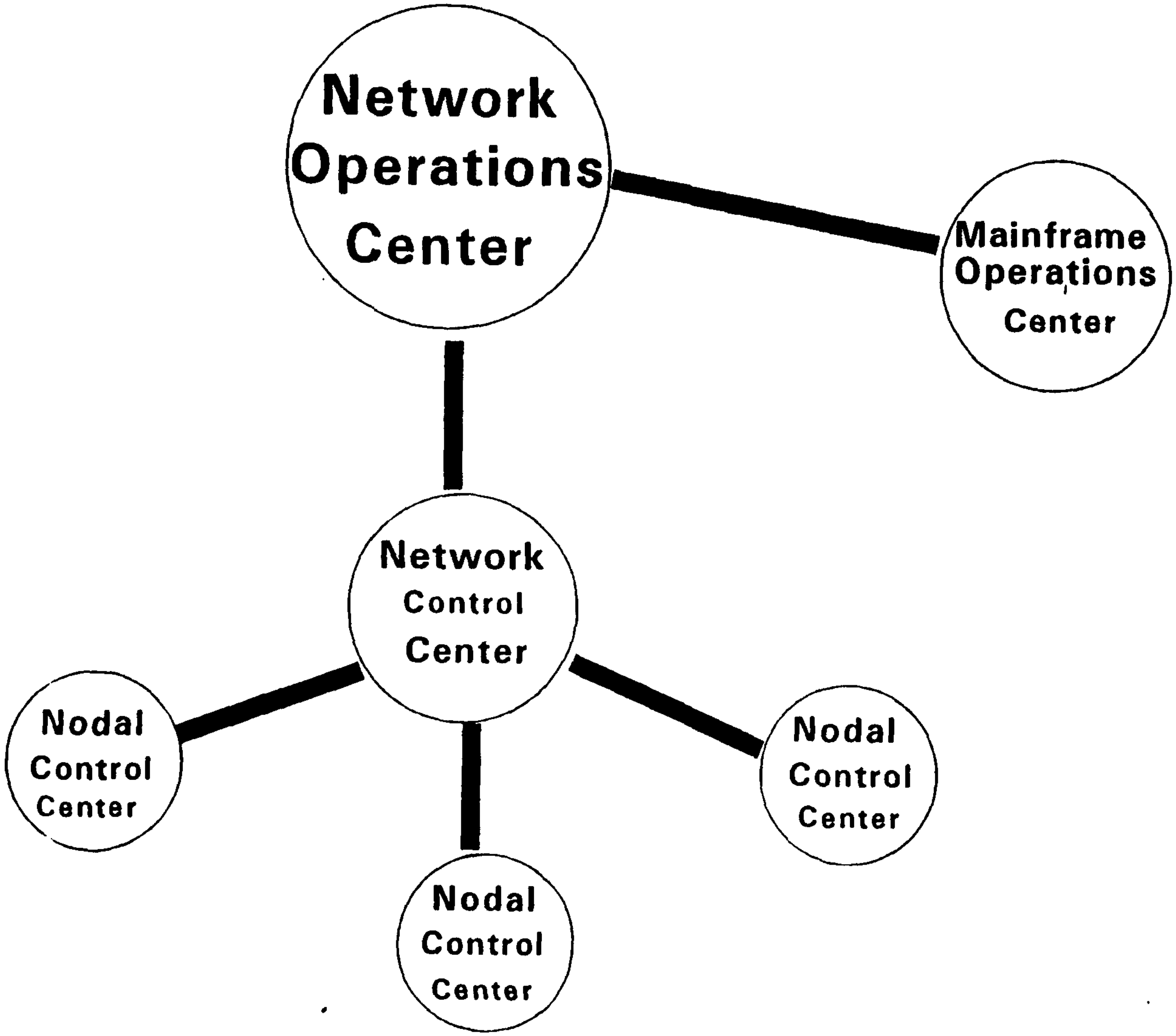
Subordinate to the NOC. Staffed by the FSSG ISMO.
Responsible for:

*Mainframe processing centers in the MEF AO
*Class II software support

Nodal Control Center

Subordinate to the Network Control Center. Staffed by the Communications Battalion (with augmentation).
Responsible for:

*Installing, operating and maintaining a node within the MEF systems network
*Supporting the C2 systems requirements of designated MAGTF units



Systems management organizations

Bibliography

1. Bradley, G. R. Lieutenant Colonel, USMC. Personal interview, MCCDC. 24 Nov 1992.

2. Breth, Frank J. and Phillips, Richard L. "C4I2 Concept- A Bold Move!," Marine Corps Gazette, Mar 1988: 16-18.

3. Coakley, Thomas P. Command and Control for War and Peace. Washington, D.C.: National University Press, 1992.

4. Commanding Gen[illegible]l, I MEF letter, "Command and Staff Relatic[illegible]nips with 1st SRIG," dated 1 Feb 1992.

5. Commanding General, I MEF, "Proposed Modification to T/O 4918, MEF Command Element."

6. Commanding Officer, 2d SRIG, Electronic mail questionnaire response dated 27 Jan 1993.

7. Gray, A. M. General, USMC, "C4I2 Concept." CMC White Letter 01-91. 12 Dec 1990.

8. Houstan, D. P. Colonel, USMC. Personal interview, MCCDC. 14 Jan 1993.

9. Jenkins Jr, H. W. Major General, USMC. Personal interview, HQMC. 25 Nov 1992.

10. Macedonia, Michael R. Major, USA, "Information Technology in Desert Storm," Military Review, Oct 1992: 34-41.

11. Mazzara, Andrew F. Lieutenant Colonel, USMC. "Out of the Fog," Proceedings, Feb 1993: 59-62.

12. MCCDC Action Brief. "C4I MAGTF Planner AMOS," undated.

13. MCCTA Point paper, "An Effective G-6 Force Structure and a Combined Communications and Data Systems MOS Structure Must Be Aggresively Implemented and Consistant with DMRD-918," dated 9 Feb 1993.

14. Pratt, A. N. Colonel, USMC. Personal interview, MCCDC. 15 Jan 1993.

15. 2d SRIG Talking paper. "Future of the SRIG," dated 1 October 1992.

16. Shea, R. M. Colonel, USMC. Personal interview, MCCDC. Various dates.

17. Steele, Robert D. "C4I: The New Linchpin," Proceedings, July 1993: 35-40.

18. Van Creveld, Martin. Command in War. Cambridge Mass.: Harvard University Press, 1985.

19. Van Riper, P. K. Brigadier General, USMC. Personal interview, MCCDC. 24 Jan 1993.

20. Van Riper, P. K. Brigadier General, USMC. Memorandum to Lieutenant General E. T. Cook dated 9 Mar 1991.

21. Vesely, J. E. Colonel, USMC. Electronic mail message dated 12 Feb 1993.

22. United States Marine Corps. Command and Control FMFM-3.

23. United States Marine Corps. ALMAR 050/93, "C4I MAGTF Systems Planner AMOS." 28 Jan 1993.

24. United States Marine Corps. Table of Organization 4918D: MEF Command Element G-6.

25. United States Marine Corps. "Requirements for Effective C2," Quad-Division C4I Standardization Conference, 20 Nov 1992.

26. United States Marine Corps. Tri-MEF Standing Operating Procedures for Communications and Computer Systems FMFMRP 3-32.

27. United States Marine Corps. Warfighting FMFM-1.

MARINE CORPS COMMUNICATION-ELECTRONIC MAINTENANCE: A BROKEN SYSTEM?

Submitted to
Major A. D. Youtzy
and Mrs. Sandra Kirkpatrick
at the Communication Officers School
Quantico, Virginia

Captain A. Fontes, USA
Captain A. M. Moreland, USMC
Captain D. A. Paris, USMC
Captain E. L. Reyelts, USMC

April 8, 1993

MARINE CORPS COMMUNICATION-ELECTRONIC MAINTENANCE:

A BROKEN SYSTEM?

OUTLINE

THESIS: The Marine Corps maintenance system is effective; however, measures can be taken to strengthen the system.

I. Introduction

II. Foundations of Communication-Electronic Maintenance

III. Personnel and Training

   A. Strength of Component Level Troubleshooting Skills
   B. Effects of Down-Sizing On Maintenance Personnel
   C. Lack of SNCO and Warrant Officer Follow-On Training
   D. Need For Microcomputer Repairers at All Levels
   E. Lack of Non-Resident Education
   F. Strengthening the Training Foundation

IV. Equipment Acquisition

   A. Examples of Acquisition Shortfalls
   B. Restructuring the Acquisition Process

V. Peacetime to Wartime Transition of Maintenance Procedures

   A. The Maintenance Forward Concept
   B. Use of Maintenance Contact Teams
   C. Automated Information System Support
   D. Transportation Shortfalls
   E. Tactical Computer Maintenance
   F. Correcting Transition Problems

VI. Conclusion

Appendix 1 - SAMPLE QUESTIONNAIRE

MARINE CORPS COMMUNICATION-ELECTRONIC MAINTENANCE:

A BROKEN SYSTEM?

> The phrase shoot, move, and communicate is widely used throughout the Marine Corps. It tells the commander, in simple language, what actions are essential to mission accomplishment. A fourth word should be added to this phrase - maintain. (2:1-1)

If equipment is not maintained in combat-ready condition, the commander will face far greater challenges in accomplishing the mission at hand.

One of the greatest challenges to the Marine Corps' command and control capability is the ability to maintain equipment in a combat environment. As increasingly advanced technology is provided by civilian industry, the maintenance effort becomes more complex. The Marine Corps must meet this maintenance challenge by ensuring that its maintenance program is virtually flawless. As FMFM 3-1 states:

> The force better able to recover damaged equipment and return it to service rapidly has a clear advantage in generating and concentrating combat power. For the force operating at a numerical disadvantage, the ability to maintain, recover, and repair equipment is even more important.

FOUNDATIONS OF COMMUNICATION-ELECTRONIC MAINTENANCE

A strong maintenance system requires superior personnel training, carefully planned acquisition policies,

adequate supply support, and sound procedures to transition from peace to war. The Marine Corps maintenance system is not broken, but numerous measures could be taken to better the system. This paper identifies existing shortfalls in the maintenance system and offers recommendations to strengthen the system. Sound maintenance procedures must be incorporated with stringent training, and maintenance concerns must be integrated into the acquisition process to ensure that our maintenance system remains *not broken*. As a result of our research, we see the foundations of the communication-electronic maintenance system to be training, acquisition, and transition to war. Each foundation contributes equally to the success of the overall system, as depicted in Figure 1.

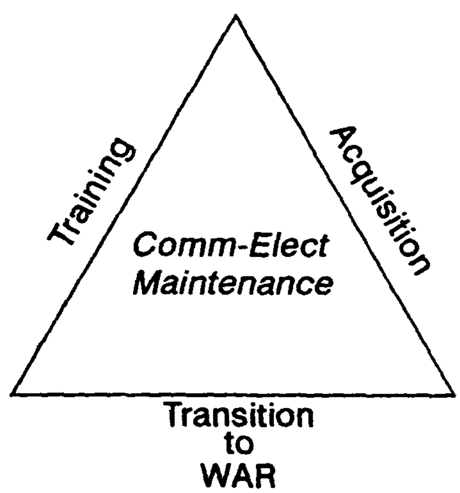


Figure 1: Foundations of the Communication-Electronic Maintenance System

PERSONNEL AND TRAINING

Training builds the first leg of the communication-electronic triangle. Training must produce a well-coordinated, combat-ready unit prepared to perform its function in a wartime environment. Because today's sophisticated systems must be maintained in a high state of readiness, qualified personnel must be available at all levels.

The Marine Corps expends considerable time and funding to provide qualified maintenance personnel to all levels within the Fleet Marine Force (FMF). Throughout our research, formal communication-electronic maintenance training was continually referred to as *exceptional.* (12) An experienced maintenance officer stated that entry level repairers in the Marine Corps may be equated with more experienced technicians in other services; technicians in the Marine Corps have the equivalent of a two-year associate's degree. (17) The level of training provided to communication-electronic maintenance personnel is indeed a tremendous strength of the overall maintenance system. All Marines entering the 2800 occupational field first attend the Marine Corps Communication-Electronic School's (MCCES) Basic Electronic Course (BEC) for thirteen weeks. Next they attend a Military Occupational Specialty (MOS) specific course or school offered by the Marine Corps or

other services. The Marine Corps strives to produce 2800s with superior technical abilities. Technical training has been structured to produce repairers and technicians who can maintain and repair, to the component level, all communication-electronic equipment as far forward as possible on the battlefield. This is particularly true for MOS 2841 Ground Radio Repairer, 2831 Microwave Equipment Repairer, and 2861 Radio Technician. These MOSs are used as feeder MOSs for other critical low density (CLD) repair MOSs such as 2834 Ground Mobile Forces (GMF) Satellite Communication (SATCOM) Technician and 2833 Fleet Satellite Terminal Technician. (3:P18)

STRENGTH OF COMPONENT LEVEL TROUBLESHOOTING

Experiences during Operations Desert Shield and Desert Storm revealed significant issues that will influence future decisions on training provided to 2800s. Despite delays in receiving repair parts from the Continental United States (CONUS), Marine Corps units were able to maintain up to ninety percent readiness for communication equipment. This success has been attributed to the level of training the Marine 2800 repairer has received, both in school and from on-the-job training (OJT). (3:P18) In a few instances, Marine Corps maintenance units were asked to perform component level repairs on Army equipment. This

assistance was possible because of the troubleshooting skills the Marine repairers possessed. Because of transportation delays, the small number of secondary repairables normally in the CLD maintenance float, the high use of equipment in a harsh desert environment, and little to no contractor maintenance support, the capability to conduct component level troubleshooting remained critical. (3:P18)

If the Marine Corps adopts the operator-maintainer concept which is currently used by the Army, the need remains for highly trained repairers at deployable intermediate level maintenance activities such as Electronic Maintenance Company (ELMACO), Force Service Support Group (FSSG). Without repairers trained to troubleshoot to the component level, equipment repairs would have to be performed at the depot level (Albany, Georgia or Barstow, California) or through contractor maintenance agreements. Neither approach facilitates performing maintenance as far forward on the battlefield as possible. The Marine Corps must continue its present system of training to produce fully qualified repairers and technicians to all levels within the FMF. (17)

EFFECTS OF DOWN-SIZING

The down-sizing of the Marine Corps will affect

maintenance personnel. As end strengths dwindle, the number of Marines in the FMF will decrease. Tables of Organization (T/Os) are being cut to accommodate manpower reductions. However, no missions have been deleted and equipment strengths have not dropped; in many cases, equipment quantities have actually increased. Yet, the number of 2800s continues to drop. (4:L11) To reduce the number of 2800s, reenlistments are being cut or eliminated entirely for certain MOSs. (23) This reduction of 2800s will force Marines to leave the service or to move to maintenance MOSs which are understaffed. The result is dramatic. The Marine Corps is in a lose-lose situation. On one hand, if a technician cannot reenlist and leaves the service, a tremendous investment of training and experience is lost. On the other hand, if a Marine makes a lateral move into another MOS, the Marine Corps will have Marines supervising MOSs in which they have no qualifications or experience. (23)

Extending the enlistment term for the 2800 community from four years to six years would maximize the investment dollars it takes to train a repairer. It normally takes one and half years for a Marine to complete recruit training and the basic electronics training leading to a 2800 MOS. This leaves approximately two and a half years to serve in the FMF and work in the MOS. For a six year

enlistment, the service time in the FMF would increase to four years. It has been argued that by the time a technician becomes proficient, the enlistment contract is ending. (31)

SNCO AND WARRANT OFFICER FOLLOW-ON TRAINING

Another concern for maintenance personnel is the lack of training provided to senior Staff Non-Commissioned Officers (SNCOs) and warrant officers. A 2800 Marine becomes a 2891 Data Communications Maintenance Chief once promoted to master sergeant. The Marine has only to have been qualified in any 2800 MOS as a gunnery sergeant. (11:3-122) Figure 2 illustrates the various paths that lead to the 2891 MOS. With the wide variety of MOSs that can become 2891s comes a wide variety of experience, or in many cases, a lack of necessary experience. (28)

Currently, no formal training program is established to transition 2800s into the senior enlisted maintenance MOS. (4:P4) Some Marines find that, once promoted to master sergeant, they cannot optimally perform because they do not possess the experience or technical skills necessary to perform as a 2891. Similarly, Marines from the Technical Controller 2823 MOS have been working so long as technical controllers between the ranks of sergeant through gunnery sergeant, that they have lost their ability to

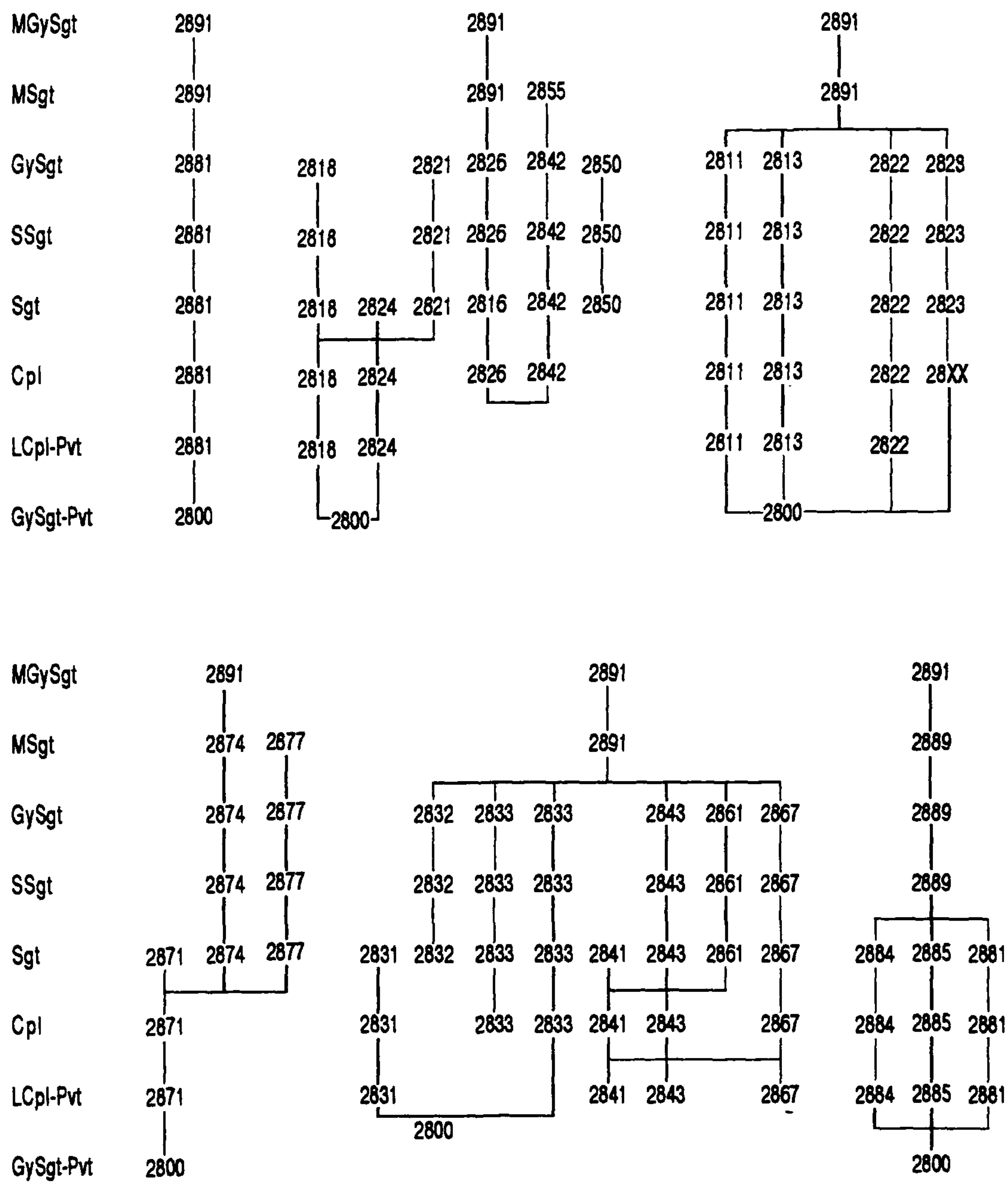


Figure 2: 2891 MOS Career Progression

perform as technicians. In the dynamic environment of today's computer and communications equipment repair community, their expertise in these areas has declined dramatically. This is also true of those maintenance management functions to which these Marines had been formerly exposed. (4:L17)

There is similar concern for new warrant officers. Newly appointed warrant officers are sent to the Basic Communication Officer's Course (BCOC). Our research indicates that this does not adequately prepare warrant officers to serve as maintenance officers. (4:P4) An Electronics Maintenance Supervisor's Course is being developed at MCCES, Twenty-Nine Palms. It is estimated that this course will be on line for future graduating classes from the warrant officer's course at The Basic School. Headquarters Marine Corps has given tentative approval to send 2805s and 2810s to this course in place of the BCOC they are now attending. However, the possibility of sending newly appointed 2891 master sergeants remains uncertain due to limited funding. (3:1)

MICROCOMPUTER REPAIR

Over the past few years, the Marine Corps has purchased a wide variety of off-the-shelf white computers, to include Zeniths and Compaqs. Repair of these computers

has been limited to using civilian contractor support and floating selected components through the maintenance float. (4:P11) As maintenance personnel learned from Operation Desert Storm, civilian contractor support is untimely and unacceptable during war. Computer repair technicians are trained primarily on the AN/UYK-83s and the AN/UYK-85s. There are few of these technicians in the field units and their expertise on commercially acquired microcomputers is limited. (4:P11) Currently, over half of the units within the Marine Division possess no organizational computer maintenance capability. Computer maintainers are omitted from the T/Os of the Headquarters Infantry Regiment, Artillery Battalion, and Assault Amphibian Battalion, among others. (4:L12) The dependence upon microcomputers has created a tremendous need for organic computer maintenance personnel in each regiment and separate battalion.

Additionally, no repair capability exists at the Communication Battalion to provide organizational or intermediate level maintenance on computer equipment. (6) The problem rests with the structure of the 2818 Teletype Technician MOS. Many computers in every unit require periodic repair, yet the current assignment of the 2818 MOS among units does not support their repair. (27) Assignment of Marines to MOS 2818 is based on the former capability they provided as teletype repairers. Since the MOS is now

primarily concerned with microcomputer repair, we must reevaluate the assignment of these maintenance personnel. The assignment of microcomputer repairers must facilitate the performance of repairs at the lowest echelon of maintenance and, in a tactical environment, as far forward as possible. Their assignment must also reflect the new MOS 2818 capability for microcomputer repair vice the old capability for only teletype repair. Of twenty-three major subordinate elements (MSEs) in the Marine Division, only twelve have microcomputer repairers. All twenty-three have End User Computer Equipment (EUCE) AN/UYK-83s and AN/UYK-85s as well as many commercial computers, each requiring regular maintenance. (27)

In the past, the assignment of 2818s corresponded with the density of teletype equipment in each unit. As the teletype has largely been replaced by the microcomputer, the MOS training for 2818s has changed accordingly, but 2818 assignment within the Marine Division has not changed. Further, the number of 2818s in each unit in no way corresponds to the density of computer equipment. (27) The Marine Corps needs a restructuring plan that would place at least one 2818 in each MSE, thus providing each MSE with organic microcomputer repair capability.

This problem can be solved despite force reductions. One such solution reduces the manning level at the infantry

battalion from two 2818s to one and redistributes the extras to other division units. It eliminates the 2889 radar repairman from the infantry regiment to compensate for any additional 2818s that are required. (4:L12) Currently, the infantry regiment holds no table of equipment items which the 2889 is trained to repair. In addition, all 2818s, 2821s, and 2824s must be trained to repair commercially procured computers. This training must be planned for and incorporated into a well designed maintenance support concept to meet future challenges in a combat environment where civilian contractor support will not be available.

NONRESIDENT EDUCATION

Another important aid in the training effort is the use of Marine Corps Institute (MCI) courses. MCI provides nonresident specialized skill training and professional military education. Currently only two correspondence courses are offered to the 2800 community. They are "Fundamentals of Digital Logic," developed for private first class (PFC) and lance corporal (LCPL), and "Introduction to Test Equipment," developed for use by those up to sergeant level who use diagnostic test equipment in the performance of their regular duties. (4:P15) These MCI courses are not sufficient for our

future needs in the maintenance support community. MCI must do for the maintenance community what it has done for other MOSs. At a minimum, MCI must develop data communication courses which are generic to the maintenance skills required to support the next generation of tactical communications equipment. Additional courses should be developed to fill the void in maintenance MOSs such as 2811 Telephone Technician, 2813 Cable System Technician, 2822 Unit Level Circuit Switch Technician, and 2823 Technical Controller, which have no formal follow-on training. With the proliferation of state-of-the-art communication equipment and the restrictive funding policy for training, alternative training methods must be used to the maximum extent.

STRENGTHENING THE TRAINING FOUNDATION

The Marine Corps has a sound maintenance traini.ŋ philosophy. It must continue to train Marines who can isolate system failures to the component level and replace these components as required. Reductions in personnel and funding are forcing reductions in training. Many of the individuals in charge of fiscal allocations are questioning large expenditures for technical training. The missing factor in the budget equation is: Can the Marine Corps perform its mission in the tactical environment with

reduced technical skills? Equipment is more sophisticated and requires advanced technical skills. Accordingly, occupational field sponsors and enlisted monitors must objectively view the situation with regard to promotions and reenlistments and make the necessary decisions based on what is best for the Marine Corps. The Marine Corps must extend initial enlistments, provide career level follow-on training, complete the curriculum for the Maintenance Supervisors Course at MCCES, ensure availability of microcomputer technicians, and establish additional MCI courses. These measures will solidify the training foundation and strengthen the first leg of the maintenance triangle.

EQUIPMENT ACQUISITION

The acquisition program, external to the Marine Corps' maintenance system, has a direct impact on maintenance support responsiveness. As a foundation of communication-electronic maintenance, the acquisition process forms the second leg of the maintenance triangle. This process concentrates on the procurement of high technology equipment for the Marine Corps to support command and control requirements and to plan for compatibility of equipment with the other services. The acquisition process does not, however, concentrate on research and development

of the maintenance concepts required to support a new system. Our research indicates that the supportability of new systems is not always considered as part of the whole systems package, but rather is considered only after equipment fielding. (23)

During procurement, supportability requirements of the systems must be developed. More often than not, new systems are fielded without a maintenance concept, which includes supporting technical manuals and publications, training plans for technicians, appropriate test equipment, and adequate Initial Issue Provisional (IIP) packages. These packages, which should contain the replacement parts for the components that are most likely to fail, are normally incomplete or contain components that are rarely used. Many new systems are fielded without a Marine Corps maintenance concept, and therefore we are dependent on civilian contractors to provide maintenance support. The inefficient acquisition process has hindered the effective maintenance operation of communication-electronic systems to include Unit Level Circuit Switch (ULCS), AN/PSC-3 satellite communication radio, Savin 7020S photo copy machines, and commercial off-the-shelf (COTS) systems.

EXAMPLES OF ACQUISITION SHORTFALLS

During initial fielding, the ULCS was designated as a

normal density item. After its employment in the FMF, the ULCS was designated as a CLD item. (4:P17) The supporting argument for this change was that operational scenarios dictate widely dispersed command posts which distance the switches from the float stores held by the FSSG. (4:P17) Because the ULCS is an essential element of a command, control and communication network, providing tactical v ice switching, any down time is considered critical. When the ULCS became a CLD item, using units were required to maintain their own maintenance floats to support the equipment. The impact of the change was felt at the maintenance depot in Albany, Georgia, which had provisioned spare parts under the original designation of normal density. When the ULCS was redesignated, the required spare parts were not available in the quantities needed. This change from normal to critical low density, which was not originally expected during the acquisition process, will cost an estimated twelve million dollars.

The procurement of the AN/PSC-3 radio is another example of an acquisition shortfall. As a CLD item, the PSC-3 receives first through fourth echelon maintenance from the using unit. Test equipment, technical manuals and publications, a kit containing at least one of all modules, and an assortment of Pre-Expended Bin (PEB) parts are required to enable the unit to conduct fault isolation and

minor alignment. (4:P13) However, these items were not fielded with the PSC-3 radio. The using units were not able to maintain the equipment until these items were procured. The Single Channel Ground-Air Radio System (SINGARS) and Global Positioning System (GPS) systems shared the same problems when they were fielded.

The Savin 7020S photo-copying machines were purchased to replace commercial copiers in garrison and to support tactical operations. Maintenance of these copiers is a responsibility of the FSSG; however, the parts required for their repair are not in the Marine Corps' supply system. Repair floats do not exist for the copiers, so repair parts must be requisitioned from the Savin Corporation. Receipt of the requisitioned items often occurs thirty days after Savin has received the broken components; the result is maintenance delays. (3)

To procure advanced technology, the Marine Corps currently purchases many COTS systems from civilian industries. These systems are purchased before a Marine Corps maintenance concept is developed; therefore, they are added to the inventory before they are supportable. (23) For example, when the white computers were purchased, the manufacturers were contracted to provide garrison maintenance as part of the warranty. When these systems were deployed in Southwest Asia, no provisions had been

made for their maintenance in country. Consequently, when the computers required maintenance, no support was readily available. Technicians must be trained to support all COTS systems purchased for Marine Corps use. This training must be identified as part of the maintenance concept during the acquisition process.

RESTRUCTURING THE ACQUISITION PROCESS

Marine Corps Systems Command's (MARCORSYSCOM) Acquisition Branch must standardize equipment fielding procedures. Equipment that cannot be supported is of little value to using units. The Marine Corps must streamline the structure of acquisition commands and agencies to support the development of maintenance concepts.

Presently, two separate commands contribute to the acquisition process. MARCORSYSCOM, which contains the Acquisition Branch at Quantico, establishes procurement priorities and solicits to Headquarters Marine Corps for budgeting. The Marine Corps Tactical Systems Support Activity (MCTSSA), located at Camp Pendleton, but also part of MARCORSYSCOM, provides testing and documenting functions. The Marine Corps Operational Testing and Evaluation Activity (MCOTEA), a separate command at Quantico, functions as an independent testing agency.

Consolidating the functions of MARCORSYSCOM and MCOTEA will allow for a cohesive, effective acquisition structure that eliminates testing redundancy and complements the acquisition process. (19)

To effectively restructure the Acquisition Branch of MARCORSYSCOM, the project manager billets for communication-electronic systems must be assigned to communication- electronic officers. Subordinate to the project manager will be an Electronic Maintenance Officer (MOS 2802, 2805, or 2810), a representative from MCTSSA, and a representative from MCOTEA. (19) The structure we propose is depicted in Figure 3. If acquisition functions are delegated to these subordinates, the current burdens on the project manager will decrease. Fielding the systems will no longer be the sole responsibility of the project manager; each subordinate will be responsible for specific functions of the acquisition process.

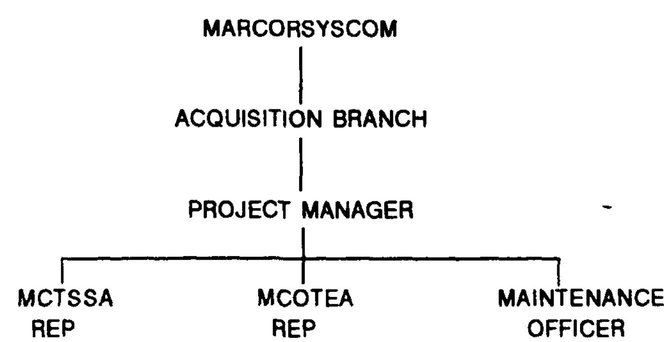


Figure 3: Proposed Acquisition Structure

The project manager's responsibilities will include prioritizing communication-electronics requirements. With input from the FMF, the project manager will continue to procure systems that satisfy Marine Corps requirements, and ensure that these systems are interoperable with other services' systems. The project manager will focus on developing budgets for systems and getting the budgets approved by Headquarters Marine Corps. (19) The project manager will also contract for civilian systems, and distribute allotted funds for initial purchase, technical training, and maintenance requirements of the systems.

The maintenance officer will advise the project manager on maintenance related issues. The maintenance officer's knowledge, acquired through first hand fleet experience, will provide the maintenance expertise required to field complete systems.

The maintenance officer's primary responsibility will be to ensure maintenance concepts are established for each procured system. Effective maintenance concepts will consist of thorough maintenance packages. These packages will include all of the supporting technical publications and manuals, the required test equipment to perform fault isolation and subsequent repair, and complete repair kits which contain the requisite number of replacement components.

Prior to procuring a new system, the MCOTEA representative will determine the Mean Time Between Failure (MTBF) of all components of the system and ensure that adequate quantities of spares are purchased to meet the MTBF rate. Civilian contractors will identify failing components; the MCOTEA representative will ensure that thorough field testing in the fleet is accomplished. This process will not only identify fault sensitive components, but will also ensure the equipment can withstand a rugged field environment and satisfy Marine Corps communication-electronic requirements.

The MCTSSA representative will review the technical manuals and publications developed by the civilian contractors to ensure that they are accurate and readable. Technical publications are vital to any maintenance effort; this step of the acquisition process is critical.

Close coordination between the maintenance officer, MCOTEA representative, and MCTSSA representative is crucial to the acquisition process. This team must integrate the testing results, the accuracy of technical manuals, and maintenance requirements to produce a complete maintenance package. The project manager must monitor the process closely to ensure adherence to any budget constraints. No system will be acquisitioned before maintenance concepts are established, and budgeting constraints must be

identified and planned for to ensure complete systems are fielded.

Restructuring the Acquisition Branch is a feasible and effective method to increase the supportability of new systems. *What is the bottom line?* The Marine Corps must incorporate a maintenance concept into the acquisition process to allow timely and effective maintenance of command and control systems. The current acquisition process does produce systems which allow our forces to "shoot, move, and communicate," but it does not produce the means to accomplish the "fourth [function which] should be added to this phrase - maintain." (2:1-1) We must combine the skills of the acquisition project manager with the knowledge and experience of the maintainer to enhance our ability to command and control the battlefield.

PEACETIME TO WARTIME TRANSITION

The final leg of the maintenance triangle is the peacetime to wartime transition of the maintenance effort. How well the Marine Corps transitions from maintenance in a garrison environment to wartime conditions is a critical function which provides commanders command and control capability during a conflict. The Marine Corps' expeditionary nature demands that we establish transition procedures and train in peacetime as we will fight in war.

Sound transition procedures will ensure the success of our maintenance support.

The Marine Corps' maintenance concept is to provide support as far forward on the battlefield as possible. This concept provides rapid, responsive repair of equipment in close proximity to the using units. The result is improved service for command and control systems.

The Marine Corps' maintenance forward concept provided significant advantages over the Army's maintenance capability during Operations Desert Shield and Desert Storm. The Army repaired most of its equipment at large maintenance facilities located in rear areas. Whole components, known as lowest repairable units (LRUs), in need of repair would be sent to these Direct Exchange (DX) facilities where the LRU would be replaced out of a stockpile of like components. The Army does attempt to repair as much equipment forward as possible. However, Army technicians lack sufficiently diverse training on various components, making it difficult for them to support different systems. Additionally, the Army's larger funding and ability to stockpile spares makes the direct exchange of LRUs possible.

During Desert Storm, Army DX facilities were often more than 300 miles from their users, which caused lengthy delays in returning equipment to forward units. When the

number of LRUs in need of repair exceeded the quantity of serviceable components held in the DX facility's stockpile, Army maintenance suffered. The Marine Corps' maintenance forward concept, on the other hand, provided a higher echelon of maintenance capability forward, making the system more responsive. (3)

MAINTENANCE FORWARD CONCEPT

Success of the maintenance forward concept is determined by established transition procedures and peacetime training. Peacetime training, accomplished during field exercises and simulated operations, tests only part of our maintenance system. Daily maintenance routines, consisting of actual equipment repair and administrative procedures, are practiced in a tactical environment the same way they are conducted in garrison. This practice alleviates some of the confusion that accompanies the transition to a real conflict; however, it does not thoroughly test other critical factors of the maintenance system which support the maintenance forward transition. These critical factors include employing CLD float blocks, employing maintenance contact teams, identifying supply support, transporting and lifting assets, identifying automated reporting requirements, and maintaining civilian contracted end items. Although these

factors can be tested to a limited degree during a field training exercise, they cannot be fully put to the test until they are employed during a conflict. Establishing sound procedures for their employment during a conflict and correcting past mistakes will enhance the effectiveness of the maintenance system.

Overall, the Marine Corps' maintenance forward concept during Operations Desert Shield and Desert Storm was successful. The quality of the technician training contributed to the success, as did the Marine Corps' employment of maintenance kits and CLD float blocks. Spare parts to repair CLD equipment were available at the intermediate maintenance level, without having to wait for shipments from logistics facilities in the States. Repair of the AN/PSC-3 single channel satellite communications radio is a primary example. Because the Marine Corps' communication battalions deployed with repair parts for CLD items, the PSC-3s in country, including those belonging to the Army, were repaired quickly, reducing down time of the radio nets they provided. (7)

MAINTENANCE CONTACT TEAMS

Maintenance contact teams also added to the success of the maintenance forward concept. Contact teams, equipped with the necessary spare parts and test equipment from rear

units, were sent to remote areas throughout the desert to repair downed equipment. The communication battalions in particular provided extensive maintenance contact team support to their detachments located with the forward units. Although providing personnel for contact teams taxed the rear unit's maintenance effort by dedicating personnel for on-call repairs, our research indicates the contact teams' contributions to the overall maintenance effort were invaluable. (5)

The Marine Corps maintenance system's transition to war was effective, but it was not without shortcomings. One major weakness was the lack of spare parts available in country. When CLD float blocks were exhausted, or when normal low density equipment was in need of repair, adequate secondary repairables were not on hand, which resulted in untimely maintenance support. Units were forced to perform selective interchange, and sometimes controlled cannibalization, of the required parts, or to delay equipment repair until parts became available. (15,17)

AUTOMATED INFORMATION SYSTEM SUPPORT

Another shortcoming of the maintenance system's transition to the field was the piecemeal employment of the Supported Activities Supply System (SASSY) and Marine Corps

Integrated Maintenance Management System (MIMMS) Automated Information Systems (AIS) at the start of the war. Full implementation of these systems was delayed for two reasons. First, the daily volume of processing support required for MIMMS and SASSY transactions was underestimated during the planning phase of the operation. The Information Systems Management Officer (ISMO) and the functional managers of supply and maintenance did not anticipate the large support requirements that surfaced within the first few months. Once the Marine Expeditionary Force (MEF) was fully established in country, the volume of SASSY and MIMMS transactions increased dramatically. The limited processing capability of the Intermediate Force Automated Service Center (IFASC), which was initially deployed to meet AIS requirements, was not adequate to meet the high volume of daily processing transactions. It was not until the Deployed Regional Automated Service Center (DRASC) was deployed to the theater of operations that the problem was finally solved. The DRASC provided sufficient mainframe processing support to meet the MEF's requirements.

Second, the dedicated data communication link required for connectivity between the DRASC and the supporting Regional Automated Service Center (RASC) in Okinawa, Japan, was not established in time to meet the processing

requirements of the MEF. This link was essential for the high speed data transfer over the Marine Corps Data Network (MCDN) which provides SASSY and MIMMS support. Installation of other command and control communication links held a higher priority and were responsible for delaying the dedicated data communication link. Eventually this data link was provided when an AN/TSC-93A satellite communication path was established. (8)

TRANSPORTATION SHORTFALLS

The lack of transportation and lift assets available to support the maintenance effort was another shortcoming. Dedicated transportation was not available for moving maintenance shelters, repair parts, and repaired equipment to forward units. For example, forward units often had to drive one hundred miles or more to retrieve priority equipment that was repaired at the major maintenance facilities at ELMACO at the Port of Al Jubayl. (9) Movement of maintenance shelters provided another transportation problem. The dragon wagon (LVS) was the only asset capable of transporting the large shelters, but higher logistical priorities - providing beans, bullets and bandaids - limited their availability. Host Nation Support (HNS) and British motor transport assets eventually transported many of these shelters. (13)

TACTICAL COMPUTER MAINTENANCE

Another shortcoming was the dependence on civilian contractors for equipment maintenance. The AN/UYK-83 and AN/UYK-85 tactical computers were purchased with civilian contracted maintenance. Marine Corps maintenance facilities held limited assets to float monitors and printers for these systems. However, when the central processing units required repair, they had to be evacuated to the States for civilian maintenance. (10) The reduced response time for recovering these units degraded the effectiveness of the vital Local and Wide Area Networks (LAN/WAN) which they supported.

CORRECTING TRANSITION PROBLEMS

Providing maintenance as far forward as possible is necessary for command and control support in a combat environment. Correcting transition problems will enhance the Marine Corps' ability to provide this support. Supply and maintenance units must coordinate what repair parts should deploy with units in the floats and maintenance kits. This coordination will alleviate the spare parts deficiencies for repairs once units arrive in country and prevent resorting to selective interchange or cannibalization to repair equipment quickly. ISMOs and functional managers of SASSY and MIMMS must correctly

estimate the daily volume of transactions in order to predict mainframe processing requirements. Identifying maintenance requirements to the ISMO in the States must be accomplished as early as possible. Prior to deploying, using units must identify transportation requirements for maintenance shelters and repaired equipment to the FSSG's Motor Transport Battalion. Establishing transportation priorities and dedicating assets early on will prevent heavy reliance on HNS or allied assets. Finally, technicians must be trained to repair all tactical and off-the-shelf equipment to prevent dependence on civilian contractors. Fast paced operations cannot be degraded because technicians are not authorized or trained to repair equipment in country.

CONCLUSION

The Marine Corps' maintenance system is effective, but measures can be taken to improve the system. By analyzing each leg of the communication-electronic maintenance triangle, we have identified measures by which the system can be strengthened. The Marine Corps produces well trained technicians, but must implement the outlined training recommendations to maximize the investment dollars required to train technicians. Restructuring the equipment acquisition process will ensure maintenance concepts are

developed to support and sustain procured systems. Finally, thorough planning for maintenance concerns prior to deployment will strengthen the maintenance forward concept. Training, acquisition, and the transition from peacetime to wartime are absolutely critical to promote a virtually flawless maintenance system. These maintenance foundations, when integrated with the communication--electronic maintenance triangle, support the command and control of our forces during a conflict. Only by implementing these recommendations will the Marine Corps continue to have an effective and responsive maintenance system.

APPENDIX 1

SAMPLE QUESTIONNAIRE

Input for this research was obtained from information received in response to the following questionnaire. Responses were given under a non-attribution policy; therefore, no names are associated with the information.

Questionnaires were distributed to 26 Marines. Twenty-one responses were received from staff non commissioned officers, warrant officers, limited duty officers, company grade officers, and field grade officers. Experience with the Marine Corps maintenance system ranged from ten to more than 25 years. Ninety percent of the responses came from maintenance LDOs, field grade maintenance officers, and field grade communication officers. All had extensive communication-electronic maintenance experience in the FMF and MCCDC, Quantico. Each respondent agreed that the Marine Corps maintenance system was not broken but offered insight into areas which could be improved.

APPENDIX 1

MARINE CORPS MAINTENANCE SYSTEM QUESTIONNAIRE

Note: Please highlight any areas you would like to see emphasized in our research paper.

1. What problems do you see in the Marine Corps maintenance system for comm-elect and motor transport, specifically personnel/training, equipment, and supply?

2. How (if at all) does the acquisition process hinder the maintenance system? What causes these problems? How could they be solved?

3. What were the strengths and weaknesses of the maintenance system during Operations Desert Shield and Desert Storm? How did acquisition play a role as a strength or weakness?

4. Does the maintenance system efficiently and effectively transition from garrison functions to wartime and exercise operations? If so, how? If not, why?

5. Should the stockpiling of significant quantities of spare parts to expand PEB items be authorized within units? Would this assist in repairing equipment in a more timely manner? If so, how? If not, why?

6. Do you think the standard maintenance reporting procedures (LM2 reports and DPRs) are accurate and useful for commanders?
If not, how would you make them so? Is there a better alternative?

7. Are the Prepositioned Wartime Reserves (PWR) and the float systems effective and efficient? If not, how could we make them more so?

8. Is the Marine Corps maintenance system broken in any aspect?
Yes or No? How? Why? Recommended solutions?

BIBLIOGRAPHY

1. Command and Staff Action, FMFM 3-1, 21 May 1979.

2. Commander's Guide to Maintenance, FMFRP 4-15, 4 September 1990.

3. Communication-Electronic Supportability Conference, FY91.

4. Communication-Electronic Supportability Conference, FY92.

5. Marine Corps Lessons Learned, Number 10773-98348 (05896).

6. Marine Corps Lessons Learned, Number 30430-54955 (04733).

7. Marine Corps Lessons Learned, Number 30450-07601 (04734).

8. Marine Corps Lessons Learned, Number 30474-14919 (04735).

9. Marine Corps Lessons Learned, Number 32343-65862 (05476).

10. Marine Corps Lessons Learned, Number 32421-77455 (05478).

11. Marine Corps Order P1200.7L, Military Occupational Specialties Manual, 1 April 1992.

12. Personal Interview Number 1, Colonel, USMC, Communications Officer, former Commanding Officer of Communication Battalion, 10 November 1992.

13. Personal Interview Number 2, Lieutenant Colonel, USMC, Maintenance Officer, HQMC Specialist for 2800 Community, 24 November 1992.

14. Personal Interview Number 3, Major, USMC, Maintenance Officer, MARCORSYSCOM, 16 December 1992.

15. Personal Interview Number 4, Captain LDO, USMC, Maintenance Officer, Communication Battalion, 6 October 1992.

16. Personal Interview Number 5, Captain LDO, USMC, aintenance Officer, former Commanding Officer, ELMACO, 2 November 1992.

17. Personal Interview Number 6, Lieutenant Colonel, USMC, Maintenance Officer, MARCORSYSCOM, 24 November 1992.

18. Personal Interview Number 7, Lieutenant Colonel, USMC, Maintenance Officer, MARCORSYSCOM, 3 December 1992.

19. Personal Interview Number 8, Major, USMC, Communications Officer, 8 February 1993.

20. Questionnaire Number 1, Master Gunnery Sergeant, USMC, Maintenance Chief, 30 December 1992.

21. Questionnaire Number 2, former Major, USMC, Supply Officer 1 December 1992.

22. Questionnaire Number 3, Captain LDO, USMC, Maintenance Officer, MCCDC, 16 December 1992.

23. Questionnaire Number 4, Chief Warrant Officer USMC, Maintenance Officer, Communication Battalion and ELMACO, 23 November 1992.

24. Questionnaire Number 5, Warrant Officer, USMC, Maintenance Officer, 23 November 1992.

25. Questionnaire Number 6, Chief Warrant Officer, USMC, Maintenance Officer, ELMACO, 24 November 1992.

26. Questionnaire Number 7, Chief Warrant Officer, USMC, Maintenance Officer, 3 December 1992.

27. Questionnaire Number 8, Major, USMC, Maintenance Officer, ELMACO, 24 November 1992.

28. Questionnaire Number 9, First Lieutenant, USMC, Maintenance Officer, ELMACO, 23 November 1992.

29. Questionnaire Number 10, First Lieutenant, USMC, Maintenance Officer, MCCDC, 22 November 1992.

30. Questionnaire Number 11, Staff Sergeant, USMC, Maintenance Chief, 19 November 1992.

31. Questionnaire Number 12, Captain, USMC, Maintenance Officer, 7 December 1992.

32. Questionnaire Number 13, Chief Warrant Officer, USMC, Maintenance Officer, MCCDC, 22 November 1992.

SHOOT 'EM ALL DOWN -- LET GOD SORT 'EM OUT: Effective Command and Control for the LAV/AD

Submitted to
Major C. J. Conlan
and Mrs. Lloyd-Stanger
at the Communication Officers School
Quantico, Virginia

Captain Fritz Doran USMC
Captain Pat Spurr USMC
Captain Kim Graham USMC
Captain Phillip Viersen USA

United States Marine Corps

April 8, 1993

SHOOT 'EM ALL DOWN -- LET GOD SORT 'EM OUT:
Effective Command and Control for the LAV/AD

OUTLINE

Thesis statement: Despite aviators' misgivings, existing technology and procedural controls will be sufficient to provide effective command and control to the LAV/AD.

I. Why do we NEED an LAV/AD?
   A. MAA-32 and -35 identified weaknesses in USMC air defense capabilities.
   B. Some weaknesses can only be corrected by LAV/AD.

II. Why aren't we working with the Army on the LAV/AD?
   A. The Army is the primary agent responsible for surface-to-air missile systems.
   B. The Army is not interested in the LAV/AD.
   C. A joint Army/Marine AD turret is possible.

III. What are the strengths/weaknesses of the LAV/AD?
   A. LAV/AD has better IFF abilities than Stinger MANPADS.
   B. LAV/AD has multiple Stinger pods and a GAU-12 gun.
   C. LAV/AD has LAV's mobility and armor protection.
   D. Training of LAV/AD gunners will be an issue.
   E. The main weakness of LAV/AD is communications.
   F. Putting LAV/AD section leader in a modified LAV/L might solve this problem.
   G. There is limited space for the crew of an LAV/AD.
   H. The LAV/L option might also solve this problem.

IV. Why does doctrine call for GCE control of the LAV/AD?
   A. The GCE currently controls all LAVs.
   B. Putting the LAV/AD with the GCE allows LAV/AD crews to train with ground units.
   C. Air defense and ground COs must work together.

V. How will the LAV/AD get its queuing from the MACCS?
   A. When stationary, LAV/AD receives MACCS cueing.
   B. When maneuvering, LAV/AD will operate under ROE.
   C. This is the same way Stinger units operate now.

VI. Command, Control, and the Future
   A. The ADCP will be a key to decentralizing command and control within the MACCS.
   B. Until the ADCP is available, we will rely current technology and existing procedural controls.
   C. We must educate aviators, ground commanders, and air defenders on the capabilities of the LAV/AD.

VII. Bibliography

SHOOT 'EM ALL DOWN -- LET GOD SORT 'EM OUT:

Effective Command and Control for the LAV/AD

The Marine Corps has been authorized to purchase 21 light armored vehicle air defense (LAV/AD) variants in fiscal year 1994. The LAV/AD should correct many deficiencies in MAGTF air defense identified in Mission Area Analysis Number 32 (MAA-32) and MAA-35. This is a new weapons system, and the Marine Corps needs to give serious thought to providing command and control to the operator of the system. An LAV/AD is shown in figure 1.

There are some who feel that the doctrinal issues of how to command and control this new weapons system have been resolved. The LAV/AD project manager works at the Requirements Division of the Marine Corps Combat Development Center. He feels that command and control problems will be solved by the application of new technology to existing doctrine.(10) Problems in autonomous operations will be solved by adding passive sensors to the LAV/AD and using existing procedural controls. New communications technology will enable the LAV/AD to be integrated into the Marine Air Command and Control System (MACCS) during static defensive operations.

Others, aviators in particular, feel that the LAV/AD will be a dangerous liability during a conflict, particularly to friendly aircraft. Its high mobility on the

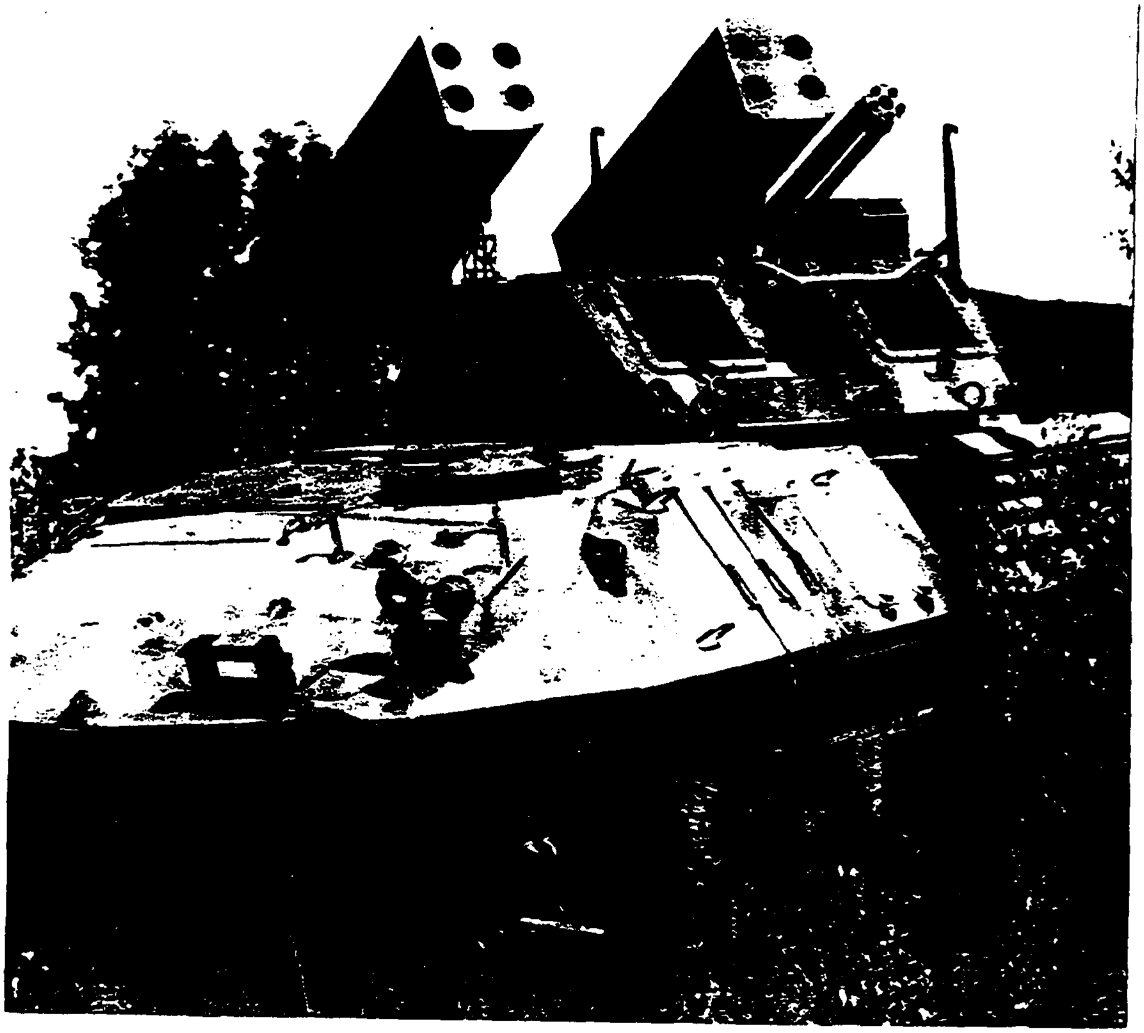


Figure 1. Light armored vehicle, air defense (LAV/AD).

battlefield, coupled with the rapid response required to engage fast-moving targets, degrades its already limited identification friend or foe (IFF) capability. Aviators are concerned that, since the LAV/AD will be operating forward of main forces and in conjunction with armored units, it will be out of range of MACCS cueing. For these reasons, pilots are uncomfortable with the status of command and

control aspects of the LAV/AD.

Aviators and ground-based air defense specialists disagree on several points. However, they agree on one thing: until the passive sensors and advanced communications platforms mentioned above become available, there will be deficiencies in effective command and control of the LAV/AD. Are these problems insurmountable? We think not. Our view is that, despite these and other deficiencies, **existing technology and procedural controls will be sufficient to provide effective command and control to the LAV/AD.**

How can we prove this point? First we need to answer some questions:

1) Why do we NEED an LAV/AD?

2) Why aren't we working together with the Army on the development of the LAV/AD?

3) What are the strengths and weaknesses of the LAV/AD, and when is it preferable to Stinger Man-Portable Air Defense Systems (MANPADS)?

4) Why does proposed doctrine call for the LAV/AD to be under ground combat element (GCE) control? and

5) How will the LAV/AD get its cueing from the Marine Air Command and Control System (MACCS)?

The real key to solving the command and control issues for the LAV/AD is solving the problem with the MACCS itself. Major Robert J. Bozelli summarized the solution succinctly in an article in the Marine Corps Gazette:

"The MACCS should adopt a refined concept of employment stressing mobility, survivability, integration with the entire combined arms network, and above all, optimum decentralization." (2:22-23)

The Requirements Division is developing doctrine for use of the LAV/AD which incorporates this mobility, survivability, and integration; the only element missing is command and control decentralization. With existing technology and proper procedural controls, the Marine Corps CAN provide decentralized command and control for LAV/ADs, and fulfill Bozelli's requirements for effective command and control.

WHY DO WE NEED AN LAV/AD?

The "Air Defense" and the "Control of Aircraft and Missiles" studies pointed out a shortfall in air defense capabilities, particularly in providing air defense support to mobile armored forces. These forces, mounted in high-speed wheeled or tracked vehicles, typically outran their air defense coverage. The solution proposed by these studies is the air defense variant of the light armored vehicle, or LAV/AD. The LAV/AD is under development and currently undergoing operational testing and evaluation. While the LAV/AD weapons system is being developed, air defense specialists are working to develop doctrinal

concepts for the LAV/AD's integration into the Fleet Marine Force. Many view this parallel development as a weakness and feel that doctrine should be developed first, and the equipment developed to support the doctrine. This parallel development is probably the main reason that some question the need for the LAV/AD. The truth is that equipment funding and development of doctrine many times do not have matching timetables.(14) Sometimes a shortfall can be corrected by simply changing or adding a procedure. Such was not the case here, however. Two separate work groups within the Requirements Division of the Warfighting Center, Marine Corps Combat Development Command determined that a new weapons system was the only solution to some of the problems. The LAV/AD is that weapons system, and it has a major role in Marine Corps air defense of the future.

WHY AREN'T WE WORKING TOGETHER WITH THE ARMY ON THE LAV/AD?

The Army is the primary agent responsible for development of surface-to-air weapons systems, and the program manager for the LAV program is the U.S. Army Tank and Automotive Command (TACOM) in Warren, Michigan. It seems natural that the Army would take the lead on this project. Initially, the Army was working jointly with the Marine Corps to develop an armored air defense vehicle.

However, the Army opted for a different weapons system, and we stayed with the LAV. The Army built its requirement around the Air Defense Anti-Tank System, or ADATS. This was a truly multi-purpose weapons platform, designed to go toe-to-toe with armor. This requirement meant that the envisioned vehicle would be very heavy and very expensive. Since the Marine Corps always tries to have tactical and strategic mobility, and since budgetary considerations are always important, the LAV/AD was our logical choice.

Today the Army is looking at another solution, since the ADATS program is defunct. High maintenance, low reliability, and prohibitive cost ($18 million per firing unit, vice $2.25 to 2.5 million for an LAV/AD) were contributing factors to the ADATS' demise. The Army is now testing four weapons systems as possible solutions to the ADATS requirement. These systems are based on the Army's Bradley Infantry Fighting Vehicle (IFV). The Army was allotted $7.5 million in fiscal year 1993 to conduct a turret study; this study will determine which of the candidate turrets will be installed on an IFV to become the Army's ADATS replacement. The four turrets being considered include the General Electric air defense turret which is on the LAV/AD, an Avenger turret, an FMC turret which was considered for the LAV/AD but rejected, and a Bradley-developed air defense turret. The Army obviously intends to use its Bradley heavy-armor vehicle as the chassis for its

own air defense variant. The Marine Corps' classical tradeoff is swapping heavy armor for speed, hence our choice of the LAV for our chassis. Therefore, although the Marines and the Army may develop a common air defense turret, a joint AD weapons system seems out of the question.

WHAT ARE THE STRENGTHS/WEAKNESSES OF THE LAV/AD?

The LAV/AD has some extremely desirable technical characteristics. (See figure 2.) It provides the MAGTF an air defense system with greater mobility and tactical flexibility than existing Stinger MANPADS. There is also some ballistic protection for the crew. The original design requirements called for multiple sensor systems: IFF equipment, a radio frequency interferometer, infrared search and track system (IRST), and daylight television/forward looking infrared system (TV/FLIR). Because developmental time was short and associated costs were high, the radio interferometer and IRST were not included in the initial versions, but were envisioned as part of a later product-improvement program. An acoustic sensor is now planned to be the primary sensor addition on follow-on LAV/ADs. The first LAV/ADs will have IFF and TV/FLIR capabilities, enabling the LAV/AD gunner to differentiate between friendly and enemy aircraft despite being confined

Combat Weight	Less than 29,000 lbs. (13182 kg)
Turret Weight	5900 lbs. (2676 kg)
Crew	Driver, Gunner, and Commander
Armament	GAU-12/U, 25mm Gatling Gun
	8 Stinger missiles (ready to fire)
Total Ammunition	
25mm Ammunition	990 rounds
Stinger Missiles	16
Firing Rate	1800 shots per minute
Turret Azimuth	Unlimited
Gun, Stinger elevation	-8 degrees to +65 degrees
Sight	FLIR/TV/Eye-safe laser range finder
Digital Fire Control	Full solution fire-on-the-move
Sensors	Temperature/Pressure/Wind/Vehicle Tilt

Figure 2. LAV/AD Technical Characteristics.

within the air defense turret of the LAV/AD.

The LAV/AD will have two primary weapons to use against aircraft -- the Stinger missile system and the GAU-12 gatling gun. The follow-on to the Hydra 70 2.75-inch hypervelocity rocket was also tested as a possible weapon which the LAV/AD would bring to the battlefield. Hydras will not be included in the initial program, but remain a definite possibility for a follow-on program. The mounting

points used for the Hydra are identical to those used by the Stinger pod on the universal mount, and in the future could be used to mount the Hydra on the turret. The Hydra 70 follow-on can be used in its current configuration without modification. It is available in the inventory and compatible with the fire control system on the vehicle. The fire control computer will be used in conjunction with the sensor data from the TV/FLIR to accurately produce a firing solution for whichever weapon is selected. These capabilities make the LAV/AD more desirable than the MANPADS for use with armored maneuver elements.

The operational capabilities of the weapons system itself are more than adequate for the near term. The increased mobility and protection provided to the Stinger team mounted on an LAV will allow mechanized and motorized forces to have a self-protection capability against hostile aircraft. Additionally, the LAV/AD can supposedly survive grazing fire from a .50 caliber weapon. The capability to fire on the move is a definite improvement over having Stinger teams mounted in high mobility multi-purpose wheeled vehicles (HMMWVs) or other vehicles. The commonality of systems for the LAV family of vehicles, the GAU-12 gatling gun, and the Stinger missile ensures availability of logistics support and better operating costs over time.

A weapons system is only as good as its operator. Who will operate the LAV/AD? Currently, the table of

organization (T/O) for the LAV/AD Company in the Light Armored Reconnaissance (LAR) Battalion shows Stinger gunner (7212) billets. These billets were converted from infantry billets, so the 72 field will gain more billets when the LAR concept becomes reality. Current plans call for a common training pipeline for Stinger gunners in the future. Military Occupational Specialty (MOS) 7212s will be trained to operate man-portable Stingers. Current plans call for follow-on training to be provided to qualify Stinger gunners to operate both the Avenger and the LAV/AD fire control systems. The Avenger is a similar weapons system with a turret similar to the LAV/AD's but mounted on a HMMWV. This training is supposed to ensure that, no matter what vehicle the weapons system is on, a 7212 will be able to employ the entire weapons system to its full capability. Plans currently being developed will allow all Stinger gunners to fire a live missile once per year, further improving the skills of Stinger gunners. Finally, an often overlooked yet vitally important skill for an operator is the ability to quickly and accurately identify aircraft. This is arguably THE most important skill for a Stinger gunner and cannot be overemphasized during training. For an LAV/AD section operating autonomously, visual ID will probably be the ONLY method available for identifying incoming bogies.

At least one air defender has doubts as to whether or not a single Marine can be trained to employ all three

weapons systems effectively.(1) While the missiles are the same, the firing procedures for each system are not. If actual experience shows that it is not feasible to train a Marine to operate all three systems <u>effectively</u>, the Marine Corps will have to consider the possibility of having three separate Stinger gunner MOSs. This lack of a common MOS for all three weapons systems will probably be a weakness.

The main cause of concern for LAV/AD critics is its weak communications capability. Voice communication will be possible via either HF radio or single channel ground-air radio system (SINCGARS) VHF radio; however, the LAV/AD cannot talk HF while moving since it has to travel with its HF antenna in the horizontal position. (See figure 3.) While moving, the LAV/AD will be totally dependent on SINCGARS for its cueing, control, and early warning. Until the planned installations of the interferometers and IRSTs becomes a reality, the gunners on the LAV/AD will have to rely mostly on their ability to visually identify targets before shooting them. The TV/FLIR system on the LAV/AD increases the operator's capabilities to identify bogies.

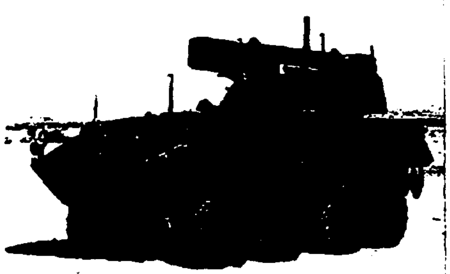


Figure 3. The HF antenna on the LAV/AD (front right of chassis) must be secured in the horizontal position when the LAV/AD moves.

However, this method is still viewed as inadequate by pilots, who could be unknowingly closing on an LAV/AD at 600 knots. From the front, an F/A-18 looks like a MIG-29. In this situation, with only visual means of identifying aircraft, an isolated gunner has a tough decision to make. If he makes the wrong decision, his unit suffers casualties or he shoots down a friendly aircraft. This problem is not limited to the LAV/AD; all Stinger gunners are faced with these difficult decisions. The LAV/AD's ability to fire multiple missiles quickly makes the problem more menacing for aviators operating near an LAV/AD section.

The LAV/AD's strengths are in danger of being negated by its communications weakness, but we feel a procedural fix could balance the equation. Current doctrine calls for an LAV/AD Company in the Combined Arms Regiment of the near future. The smallest unit of the LAV/AD company is the section, composed of four LAV/ADs. Given the weak communications capabilities of LAV/ADs, it seems that the section leader should be mounted in some other vehicle. A standard LAV-25 or an LAV command and control variant (LAV/C2) both offer better communications than the LAV/AD. Marine Corps Systems Command has an even better idea: mount the section leader in an LAV logistics variant (LAV/L).(1) We feel that mounting the section leader in an LAV/L is a

plausible solution to offset the communications problem. An LAV/L has space enough to mount HF, UHF, and SINCGARS VHF radios, and they should be able to be used while moving. Communications would be greatly improved in this case. The section leader could tie into MACCS agencies via HF, UHF, or VHF for cueing. This cueing information would then be passed to his firing units via SINCGARS. A data link via HF data communications terminal (DCT) would further augment the air picture for the section leader and would rival the one provided to HAWK and Stinger teams today. With this improvement in voice and data connectivity, the LAV/AD section can overcome the communications problems inherent in the LAV/AD.

Another weakness of the LAV/AD is the limited space available to the crew of the weapons system. Marines currently testing LAV/AD prototypes find that they must hang their packs on the outside of the LAV; there is not enough room inside the chassis for pack storage. Once again, the LAV/L offers a solution. Because it is a logistics vehicle, the LAV/L has ample room inside the chassis for crew packs, extra Stinger missiles, food, and water. All this extra gear can be loaded into an LAV/L without degrading the section leader's capability to use his vehicle for command and control of his section. In fact, command and control could be enhanced by putting the section leader's command post (CP) inside the vehicle. The LAV/L offers the same

mobility as other LAVs, but is the cheapest LAV variant. Also, the LAV/L is already in the Marine Corps inventory. These benefits plus the extra room offered make the LAV/L an ideal choice for an LAV/AD section CP. Adding an LAV/L and subtracting one LAV/AD from the T/E for an LAV/AD section is the best way to solve the problem of limited communications and storage capabilities in the LAV/AD.

WHY DOES DOCTRINE CALL FOR GCE CONTROL OF THE LAV/AD?

The Ground Combat Element (GCE) currently has control of all LAVs. The doctrine being developed also calls for the LAV/AD to be under GCE control. When the LAR Battalion concept becomes reality, this battalion will be responsible for maintenance and operation of all LAVs. This does not mean that the ACE will have no control over the system through MACCS, however. The same rules of engagement will apply to this system as apply to Stinger teams operating with the GCE. The LAV/AD firing units will be integrated into the MACCS in the same manner as elements of the Low Altitude Air Defense (LAAD) Battery are now. The GCE commander will not be authorized to change rules of engagement, but he will never be denied the right of self-defense.

GCE control of the LAV/AD involves operational

training. Air defense officers complain that ground units do not know how to use their attached Stinger assets properly. Part of the problem lies in the difficulty of being able to train together; Stinger teams rarely get a chance to conduct exercises with the ground units they are tasked to support. If the LAV/AD is permanently assigned to the GCE, mutual learning will take place. The GCE commander will have his LAV/AD commander available to advise him on how best to use the assets, and the LAV/AD commander will be able to train often with the supported command. The effectiveness of this relationship will be dependent on these two commanders. If the two are willing to learn more about each other's jobs, then the incorporation of the LAV/AD into GCE units will go smoothly and be a great benefit to both commanders.

HOW WILL THE LAV/AD GET ITS CUEING FROM THE MACCS?

The LAV/AD is more effective when it receives early warning, or cueing, from the MACCS. If a gunner knows from which direction an enemy aircraft will appear, he can turn to face the target and acquire a firing solution quicker than if he had to search a large area. If he knows what type of aircraft he will be engaging, he has a better chance of defeating the threat. The employment of the LAV/AD will

dictate the effectiveness of its MACCS cueing. While the proposed change to the LAV/AD Company T/E would provide better MACCS connectivity to the LAV/AD, we will assume that the T/E will remain as is. The LAV/AD will be employed in either a defensive or an offensive role, and effective command and control of the LAV/AD will vary accordingly.

Marine ground units, though primarily offensive-minded, sometimes establish static defensive positions. When the LAV/AD is relatively stationary for periods of time, it could be tied in via existing communications paths to HAWK or Stinger assets using the Weapons Direction Unit (WDU) so it gets a data link air picture. This does not mean that the WDU will be a part of the LAV/AD; initial attempts at installing a WDU in an LAV/AD have failed. Instead, a WDU at a HAWK Battery Command Post (BCP) or Stinger section CP should be close enough to provide cueing to the LAV/AD via voice channels.

When units are operating in offensive maneuver warfare, MACCS cueing is not usually available. During offensive operations, the LAV/AD will have to rely on procedural control and use the Rules of Engagement (ROE) to determine whether or not it can fire on an aircraft. Minimal voice communication will be possible via either HF radio or SINCGARS VHF radio. However, the LAV/AD probably cannot talk HF on the move since the antenna is tied down while moving. During such times, the LAV/AD will be totally

dependent on SINCGARS for its cueing, control, and warning. As there is no data link air picture available in either the defensive or offensive scenarios, the LAV/AD crew members will rely on manual cross-tell procedures to pass information on targets.

Obviously, initial production models of the LAV/AD will have a real problem being integrated into the MACCS. The LAV/AD's limited communications assets restrict its capability to perform its primary mission and introduce a greater risk of possible fratricide. As one Marine aviator put it, "It's a loose cannon out on the battlefield."(6) Experience in the Gulf War, however, suggests that this fear is unfounded. No friendly aircraft were engaged or shot down by Stinger MANPADS or any other ground-based system during Desert Storm. The IFF capability and the TV/FLIR on initial LAV/ADs will give gunners the basic ability to distinguish between friendly and enemy aircraft. Also, current plans to upgrade the sensor capability include passive sensors which will give the crew a way to positively identify target aircraft using noncooperative identification (NCI) procedures. This upgrade will give the firing unit more time to react to enemy aircraft and will help prevent them from firing upon friendly targets. The system will still not be tied directly into the MACCS, but it will be operating under rules of engagement. The unit supported by the LAV/AD will have an air defense bubble moving with it on

the battlefield, and aviators and air defense units will be required to operate under the ROE written into the Air Control Order. While this uncertain situation is not ideal, it is the same one a Stinger MANPADS team could find itself in today. Procedural control based on the ROE was used in the Gulf War of 1991, and we feel that procedural controls will be adequate to control the first LAV/ADs off the assembly line in 1994. Although no Marine Stingers were launched in the Gulf War, the possibility of such a launch existed. There was also the possibility that a Stinger team would have little or no cueing from MACCS, but procedures were in place to cope with just such an occurrence. These procedures were judged adequate to deal with a Stinger engagement during the Gulf War; they will be just as applicable when the LAV/AD joins the Fleet Marine Force.

COMMAND, CONTROL, AND THE FUTURE

The real key to solving the command and control issues for the LAV/AD is solving the problems with the MACCS. A partial solution to one of these problems -- that of decentralization of command and control -- might rest with new technology. The development and fielding of the Air Defense Communications Platform (ADCP) will be a key to decentralizing command and control within the MACCS. The

THIS

PAGE

IS

MISSING

IN

ORIGINAL

DOCUMENT

10-21
10-22

BIBLIOGRAPHY

1. Bartzer, Lieutenant Colonel, USMC. Personal Interview, MCCDC. 18 Dec 1992.

2. Bozelli, R. J., Major, USMC. "Force Planning for the MACCS." Marine Corps Gazette, May 1992: 22-24.

3. Cherry, Chief Warrant Officer 3, USMC. Personal Interview, MCCDC. 19 Feb 1993.

4. Davis, D. R., Captain, USMC. "Employing LAAD in the Offense." Marine Corps Gazette, October 1992: 49-51.

5. DeSalva, P. N., Captain, USMC. "A Critical Look at Ground-Based Air Defense." Marine Corps Gazette, December 1988: 52-55.

6. Goodman, Lieutenant Colonel, USMC. Personal Interview, MCCDC. 28 Jan 1993.

7. Jonas, T. P., Captain, USMC. "An Effective MACCS." Marine Corps Gazette, May 1992: 25-26.

8. Maddox, J. R., and R. V. Goddard, Captains, USMC. "Ground-Based Air Defense: Will the MAD Battalion Concept Work?" Marine Corps Gazette, October 1992: 46-48.

9. Malone, Major, USMC. Personal Interview, MCCDC. 18 Dec 1992.

10. McLawhorn, Major, USMC. Personal Interview, MCCDC. 28 Jan 1993.

11. Ryan, J. E., Major, USMC. "Air Defense of the Light Armored Infantry Battalion." Marine Corps Gazette, December 1988: 46-50.

12. United States Army, FAAD/SHORAD Battalion Operations, Heavy Divisions, 1992.

13. United States Army, FAADS Battery Operations for Heavy Divisions, 1992.

14. Wilkes, Major, USMC. Personal Interview, MCCDC. 19 Feb 1993.

15. Wilkinson, Major, USMC. Personal Interview, MCCDC. 18 Dec 1992.

AIR TASKING ORDER GENERATION AND DISSEMINATION SYSTEMS: A SOLUTION FOR THE MARINE CORPS

Submitted to
Major Youtzy
and
Ms. Kirkpatrick
at the Communication Officers School
Quantico, Virginia

Captain J. A. Herzberg, USMC
Captain L. A. Row, USMC
Captain V. L. Tumilty, USA
Captain B. T. Vaughn, USAF

April 8, 1993

AIR TASKING ORDER GENERATION AND DISSEMINATION SYSTEMS: A SOLUTION FOR THE MARINE CORPS

OUTLINE

Thesis: Current ATO generation and dissemination methods must be revised to produce a document which is reliably transmitted to all services and is standardized in format and terminology.

I. What problems were exposed during Desert Storm?
   A. Transmission methods were ineffective.
   B. The ATO format was confusing.

II. Is CTAPS software the answer to Joint Air Tasking?
   A. The CTAPS background explains some problems.
   B. The Navy is attempting to become interoperable.
   C. The Marine Corps has concerns about CTAPS.

III. Is there a ready solution for the Marine Corps?
   A. Hardware must process any designated software.
   B. Software must be open architecture.
   C. A variety of transmission media is needed.
   D. One standardized ATO format must be created.

APPENDICES

A. Questionnaire Results
B. CTAPS Limitations/Concerns

AIR TASKING ORDER GENERATION AND DISSEMINATION SYSTEMS: A SOLUTION FOR THE MARINE CORPS

Employing aircraft as instruments of warfare evolved during World War I. Since then, many attempts to integrate the air assets of the different services resulted in competition between commanders for control of those assets and failure to accomplish the assigned mission. Integration problems, with land-based air forces of the different services, have been noted in conflicts from Midway and the Solomons through Korea and Vietnam. (19:61) The need for detailed coordination during sustained theater operations was evident in Operation Desert Storm, when 2,000 daily sorties were flown against Iraq. The common denominator of those 2,000 daily sorties was the Air Tasking Order (ATO) -- a single document described as the "blueprint" for the allied air campaign.

Current ATO generation and dissemination methods must be revised to produce a document which is reliably transmitted to all services and is standardized in format and terminology. Desert Storm highlighted critical limitations in the ATO process, and despite successful execution of the Desert Storm ATO, the services experienced difficulties in

disseminating and receiving the actual document. In January 1993, the Joint Chiefs of Staff designated an Air Force software application to be the joint standard for ATO generation, after it completes certification testing in the spring of 1993.(22) Although this will satisfy requirements for a single, interoperable ATO dissemination program, services are still working with their own specific ATO generation systems. Furthermore, this Air Force software application possesses inherent problems which must be resolved before it is accepted as a joint standard.

WHAT PROBLEMS WERE EXPOSED DURING DESERT STORM?

Desert Storm exposed serious flaws in the services' ability to share crucial air planning information via the ATO. The ATO was used by flying units and command and control agencies to plan and coordinate from 1,000 to 3,000 sorties per day. Critical, time-sensitive ATO information included mission numbers, flight call signs, radio frequencies, takeoff times, in-flight refueling information, types of ordnance to be employed, targets to be engaged, etc. Some military units received the ATO late or not at all. For air control and air defense units functioning as critical command and control nodes, not receiving the ATO could mean the difference between ensuring flight safety and contributing to fratricide. After finally receiving the

ATO, some organizations had tremendous difficulty finding needed information in the document due to its tremendous volume. We therefore perceive two major problems with the current ATO system: (1) timeliness of receipt is poor (which is inextricably tied to transmission method) and (2) the format of the document itself is confusing. Both issues were repeatedly identified in responses to questionnaires soliciting ATO problems (see Appendix A). All services must establish an automated ATO interface capability to enhance joint interoperability. Modifying existing systems to meet joint standards is an increasingly important concept given potential funding constraints.

Transmission Method

Varied methods of transmission used by each of the services complicated effective distribution of the joint ATO and contributed to timeliness problems. A Headquarters Marine Corps message noted "The single most important problem with the ATO is message dissemination rather than the format or information it contains."(4:1) Doctrinally, transmission of the ATO occurs through the use of U. S. Message Text Format (USMTF) within the military message system (Autodin) using centralized computers and printers.

However, using message transmission systems can delay the ATO because higher precedence traffic must be sent first. According to one user of the ATO:

> Both during Desert Storm and while on NAVCENT staff in the summer of '92 timeliness was always the weak link. We had four methods of receiving: GENSER message, ATOX, JOTS, and CTAPS. We would consistently receive incomplete ATO's from all systems and they were usually late. During Southern Watch, they could have the ATO written by 1500 and it would take up to eight hours to transmit.(51)

Recently (including Desert Storm), the Computer Assisted Force Management System (CAFMS) has been used by the Air Force to generate and disseminate the ATO. Units using CAFMS reported problems of lengthy transmissions (up to six hours); limited software capability; reliance upon secure communications (which may not always be available); non-standard system terms, acronyms, and procedures; and a lack of common hardware compatibility between service assets.

Ineffective transmission of the Desert Storm ATO resulted in "workarounds," including transmission through computer diskette, courier, local area network, or via modem over telephone or radio.(23:1) Although these alternative transmission methods were employed with varying degrees of effectiveness, the need for a system which conforms to joint standards still exists. Resorting to innovative "workarounds" should not be a battle management function of command and control units attempting to prosecute a theater

air campaign. A more efficient transmission means must be developed because, as Headquarters Marine Corps officially noted, "The size of the ATO message prohibits effective and timely dissemination via Autodin." (4:1) It is also important to not go to the opposite extreme and rely solely on one specialized transmission means, as this precludes needed redundancy. The other major problem we noted with the ATO, which will be examined next, is the format.

ATO Format

The ATO format used during Desert Storm was confusing because it contained too much free text information. Although standard data fields were used to provide normal ATO information (aircraft type, mission number, ordnance, and so on), the accompanying Special Instructions (SPINS) contained airspace control measures, surveillance control measures, and Operations Order changes. SPINS were transmitted during each ATO cycle and reflected daily, weekly, and monthly changes. Much of this information was written in free text rather than a specified format. The enormous amount of sortie information, when combined with the SPINS, produced an ATO averaging 600 - 750 pages in length. Many items contained in the SPINS should, according to doctrine, be published in Tactical Operations Data, Air Defense Plan, and Airspace Control Order messages. Because

the ATO and SPINS contained an inordinate amount of information and used free text writing, many users were unable to break down and disseminate necessary data. According to one unit "Even when the ATO was received, due to the size of the document, the Navy was reluctant to reproduce copies for further dissemination."(32) As a result, some Navy units, including those performing anti-air warfare functions, operated with an incomplete air picture.

The ATO standardization problem must be resolved in consonance with efforts to develop a better transmission means. The standardization process should include input from all services to ensure a useful joint document. The CAFMS system mentioned earlier is a small part of an Air Force battle management system architecture called the Contingency TACS (Theater Air Control System) Automated Planning System (CTAPS). The joint staff has declared the CTAPS ATO software application to be the joint ATO standard. This application will be reviewed in the following section.

IS CTAPS THE ANSWER TO JOINT AIR TASKING?

Despite inherent limitations, CTAPS is being developed as the joint standard for ATO systems. CTAPS is an Air Force software architecture built to Air Force standards. As a result, CTAPS was not designed to meet joint

requirements. The United States Army, as an adjunct to Air Force operations, will be accommodated in Air Force development efforts.(35:23) The Army does not use an ATO to task organic aviation assets, but must receive the ATO for other services' flights so that air defense units are informed of friendly missions. Because the Air Force is actively pursuing integration with the Army, and since the Army does not produce an ATO, future discussions will focus on Navy and Marine Corps integration efforts.

Background

The goal of CTAPS is to automate and modernize major TACS elements (Air Operations Center, Air Support Operations Center, Wing Operations Center, Control and Reporting Center) from the top down. CTAPS is an Air Force umbrella system composed of a number of software packages which will ultimately be fully integrated through a relational database system and a common operating system. CAFMS is the current ATO software package, but will eventually be replaced by the Advanced Planning System application.(44:1)

CTAPS is being developed at Langley AFB -- through non-traditional development and procurement channels. Critics outside of the Air Force believe this deviation is an attempt to subvert joint acquisition processes and that, by

developing the architecture quickly, the Air Force can circumvent joint testing and immediately subject CTAPS applications to a Joint Certification Test. To the contrary, one of the major precepts behind CTAPS was that it was to be expeditiously fielded using off-the-shelf technology, and it was not originally intended to be a joint system.

Interface problems currently affect the CTAPS architecture and could eventually be carried over into interoperability problems with other services. As an operating system, CTAPS applications are functioning independently of each other, precluding transfer of critical information. Once the CTAPS architecture is correctly integrated, an entry into one application will automatically be forwarded into related applications. For example, the Advanced Planning System will ultimately include aircraft maintenance status information, which will be used to assist with sortie scheduling and ATO generation. Incorporation of such external information to supplement or assist ATO development could pose a problem for units which are only using the ATO application of CTAPS. Aircraft maintenance status is not currently disseminated between joint units. Should this aircraft status information become essential to the production of the ATO, then the other services would be forced to use CTAPS even more than is currently anticipated. The Air Force must determine what information will become

critical for ATO development after the CTAPS architecture is functioning as a fully integrated architecture. The Air Force must then assess what subsequent requirements would be imposed on other services for the acquisition of supporting hardware and software. In addition, only thirty percent of the Advanced Planning System application is currently written in Ada, which is the joint software development language. The present decision, to use language other than Ada, could pose other joint integration problems. Designed as an Air Force system, CTAPS will need more work prior to becoming a viable joint program. Now that CTAPS development issues have been reviewed, the Navy's perspective on ATO integration efforts will be presented.

Navy Position

The Navy is proceeding with plans to establish interoperability with CTAPS using the Navy Tactical Command System - Afloat (NTCS-A). The Navy, through the Commanders-in-Chief Atlantic and Pacific, endorsed CTAPS in a recently published Concept of Operations for the Joint Force Air Component Commander.(44:11) An Air Force/Navy ATO link was established between Air Force air control units and Navy carriers/command ships, via Navy installation of Super High Frequency satellite communications equipment. A joint Memorandum of Agreement was formulated, and training and

weekly operations are underway at both 507 and 602 Air Operations Squadrons. The Navy expects to establish a joint core between the Navy Unified Build and the Air Force CTAPS which will allow sharing of applications.(1:2)

Successful deployment of CTAPS occurred, with mixed results, during Operation Southern Watch and two JCS exercises. In Southern Watch, the Navy ATO exchange system disseminated the ATO throughout the fleet by converting a CTAPS ATO into a format compatible with existing Navy satellite communications systems. During exercise Tandem Thrust 92, the 11th Air Force noted "CTAPS worked ... but was hindered by the slow baud rate.... hampered by the lack of two-way data flow. The Navy could only receive the ATO, but not pass data back to the JFACC."(6:1-3,13) During the same exercise, the commander of Carrier Group One observed "Only once was the ATO received over CTAPS or Autodin....Recommend continued development of NTCS-A and CTAPS."(6:2-12) The Navy's goal for integration of NTCS-A and CTAPS is December 1993. Issues to be resolved include communication systems, databases, hardware, and software. Specific items to be corrected are listed in Appendix B. The Marine Corps is also dealing with the issue of CTAPS integration and this process will be addressed next.

Marine Corps Concerns

The Marine Corps has serious concerns about CTAPS, and misunderstandings among Marines continue to exist. Is CTAPS hardware, software, or both? Current CTAPS applications are software "stovepipes." They use the same operating system, but do not function as an integrated architecture because they can't pass data from one application to another. One application must be able to simultaneously work with another to be "integrated." Under CTAPS, CAFMS is still the program which builds and distributes the ATO and it requires an independent work station. Simply buying into CTAPS does not provide interoperability. There are message text format disagreements between the services. Specific communication and data path requirements must be determined, and the related issue of identifying hardware requirements must be resolved.(46) The Marine Corps has limited funds with which to buy new hardware to replace or augment existing systems.

Despite being part of the Department of the Navy, the Marine Corps is not as eager as the Navy to accept CTAPS. The Marine Corps has been developing its own air command and control system during the past five years -- the Advanced Tactical Air Command Center (ATACC). The ATACC system handles many of the functions of CTAPS but is a Marine Corps specific program.(41:3) ATACC is a USMTF/Autodin-based system, and while the Marine Corps now recognizes the

impracticality of using USMTF and Autodin in large scale air campaigns, CTAPS is not yet viewed as an acceptable alternative. Marine Corps hesitancy was described in an ATO message from October 1992:

> The single most important problem with the ATO is message dissemination rather than format or information elements it contains. The size of the ATO message prohibits effective and timely dissemination via Autodin. The use of dedicated communications lines, as utilized by CTAPS, is one solution. However, adopting CTAPS, a USAF umbrella system for total battlefield management, would not address service specific requirements and would require the dedication of scarce comm circuits to ATO information exchange.(4:1)

(Other Marine-perceived limitations of the CTAPS program exist as well, and are listed in Appendix B.) The Marine Corps must interact with the Air Force to overcome CTAPS interoperability deficiencies. Discussions in the next section will focus on problems already encountered during initial testing with CTAPS and the ATACC, and potential solutions. These issues include hardware, software, transmission media, and format.

IS THERE A READY SOLUTION FOR THE MARINE CORPS?

During a recent Marine Corps conference, one of the key issues was how to achieve full ATO production capability while adhering to current Marine Corps doctrine and long

range development goals. In order to serve as the Joint Force Air Component Commander, the Marine Corps must generate and disseminate the ATO for all services, and this must occur using organic systems. Another significant observation is that, during this time of reduced military expenditures, Marines must use systems funded by other services, and can no longer afford to be unique.(46) The following paragraphs will explore potential ways to achieve the goal of acquiring ATO production capability, while using current budget appropriations and also accommodating the Joint Staff directed application.

Hardware

The ATO process requires the Marine Corps to have automated systems that are interoperable with other services and can provide joint air command and control. During an air command and control seminar in April 1992, the Marine Corps acknowledged the criticality of joint service hardware compatibility and the influence of shrinking budgets on joint systems. Marine equipment must be capable of rapid ATO construction and distribution. This equipment must be automated, and interoperable with the other services' air command and control systems. For training purposes, Marine air command and control personnel must have access to

equipment used for joint air operations and must also be trained to maintain joint equipment.(7:5)

A proposed compromise for the Marine Corps would preserve the already funded ATACC system and incorporate CTAPS, creating a joint system. Specific recommendations are to complete all ATACC testing and then purchase two complete sets of equipment, which is one half of the planned purchase. Two shelters would be provided to each aircraft wing and two to the maintenance facility at Albany, Georgia. CAFMS consoles can also be purchased (to provide immediate ATO receipt) using money available to upgrade the current system. Sun Sparc work stations can then be purchased to allow interactive exchanges with the ATO system. The ATACC funding from 1994 and 1995, (which would not be used for the second half of the originally planned purchase), could be redesignated to make the ATACC software "open architecture" so that it could then interface with CTAPS. The 1996 funds earmarked for automated data processing upgrades could be used to buy whatever work station the Air Force chooses for ultimate use with CTAPS. This total scenario was provided by an officer of the Marine Corps Systems Command and is thus believed to be a viable solution.(46) Such a compromise by the Marine Corps, to incrementally link the ATACC to CTAPS hardware, would take advantage of current development efforts and joint needs. The open environment

would also allow CTAPS to use ATACC software.(46) The next segment will discuss software issues in more detail.

Software

Software conflicts between CTAPS and ATACC must be corrected for efficient and complete data transfer to occur. ATO's were transmitted using CTAPS and ATACC during recent joint exercises. In November 1992, a 200 mission ATO from the Air Force was encrypted and transmitted to the Marine Corps in ten minutes. The ATO was pulled from CTAPS to ATACC. Manual corrections to the ATO were needed which required forty minutes of work by an operator in order to parse the data into the database.(45:1) This occurred because the ATO was not sent in the correct USMTF format and the ATACC is designed to identify errors in messages. Potential problem areas can be alleviated through agreement with the Air Force on data element definition (format), or by programming the ATACC software to recognize differences between Air Force and Navy/Marine ATO formats and automatically make corrections. Other software concerns identified by the Marine Corps are listed in Appendix B. The next area of consideration for the Marine Corps is the transmission media to be used for CTAPS.

Transmission Media

A standard communication architecture is required for ATO interoperability. The ATACC can and will automatically process USMTF formatted messages. However, if the ATO reaches the ATACC in non-USMTF format, it will not be mappable to the data base. The Marine Corps must identify the need for a dedicated communications port which can be used for passing the ATO automatically via a system other than Autodin. The USMC does not desire an extra box tacked on to the ATACC or to the Air Force's system that translates CAFMS software into ATACC software, or vice versa.

Although too slow for effective dissemination of a large ATO, Autodin is still a functional transmission means and is viable for shorter ATO's or when dedicated communications are not available. The USMC is using a bit-oriented message for transferring ATO data between Marine units along the battlefield. Using this bit-oriented message greatly reduces communication system bandwidth requirements over normal character-oriented messages. In addition, the Marine Corps is using a single shared database for Marine Corps specific messages and USMTF, which allows the ATACC to achieve rapid, automated message handling.(42:6) These concepts should be evaluated for use by all services and for the potential to reduce demands on transmission media. Again, the media must not be restricted to one type, but

must allow for variety and redundancy. In addition to resolving transmission system issues, the specific format of the ATO message must be standardized. Discussion of this issue is in the following segment.

Format

The services must agree upon which ATO format -- ATO Confirmation, Request Confirmation, or a whole new format -- should become standard. Once determined, the format must be adhered to by all services. Under current doctrine, the Air Force uses the ATO Confirmation while the Navy and Marine Corps use the Request Confirmation. The fields in the messages are different and the Marines feel strongly that they want certain features which are inherent in the Request Confirmation format. Furthermore, the Marines need an ATO document which will allow tasking of helicopters.

Specific ATO uses must be defined by all services, to hold the ATO to a manageable size and to minimize free text information. When one commander is serving as the Joint Forces Air Component Commander, the Area Air Defense Coordinator, and the Airspace Control Authority, one can easily see how too much information could be loaded into a single document -- the ATO. Joint agreement is required to resolve issues of information dissemination. Furthermore,

changes to Special Instructions should be published on an "exception/ required change basis to the basic document."(32) Formatting Tactical Operational Data information, Air Defense Plans, and Airspace Control Orders as independent messages, in accordance with current doctrine, will reduce the bulk of the ATO.

The issue of facilitating joint interoperability is complex and is more publicized today than ever before. Interoperability has received much attention since Desert Storm ended, when the military began to correct deficiencies noted during the war and to restructure for a smaller force. The lessons of Desert Storm must be learned and the errors corrected. The ATO situation is one symptom of a larger problem. There is already a pervasive interoperability problem between the services. The situation may worsen as technology advances so rapidly that military development programs are unable to keep pace. A whole new spectrum of acquisition is emerging which takes advantage of off-the-shelf hardware and software. It will become increasingly more difficult to ensure interoperability as individual services buy more and more of this equipment. The Joint Staff needs to apply controls in this area to ensure that such purchases are in the best interest of all services, and to ensure that each service can afford to purchase items when needed to integrate with others.

Establishing CTAPS ATO software as the joint standard is somewhat premature, but is an advance in the right direction. It is imperative that the ATO process be streamlined and integrated now for all services. The time has come to set aside petty service-peculiar desires and to strive for interoperability. Since CTAPS ATO software is now the joint standard, the Marine Corps must integrate this program into the ATACC. A realistic timeline allowing for acquisition, training, deployment, and employment schedules must be established. The Joint Staff should ensure that Navy and Marine Corps' concerns about CTAPS are addressed by the Air Force. Possession of an interoperable ATO generation and dissemination system, such as CTAPS, will enable the Marine Corps to effectively prosecute air operations in the joint environment. President Dwight D. Eisenhower summed up the responsibility of the military services, in a speech to the National War College in October 1950, with these words:

> If, as Services, we get too critical among ourselves, hunting for exact limiting lines in the shadow land of responsibility.... hunting for and spending our time arguing about it, we will deserve the very fate we will get in war, which is defeat. **We have got to be of one family, and it is more important today than it ever has been.**(40)

Over forty years later, General Eisenhower's words ring true -- as though written for this decade of budget cuts and worldwide crises. Today, more than ever before, the services must work as one.

APPENDIX A

QUESTIONNAIRE RESULTS

Questionnaires were sent to 45 units of the Navy, Air Force and Marine Corps. Responses were received from 39 people. It is not possible to state the exact return breakdown, because non-attribution was afforded in order to obtain a higher return. A copy of the questionnaire is included on the next two pages. A statistical summary of the results is provided here, and it clearly indicates the order of magnitude of problems to be as follows.

A. Receiving ATO in time to work it (timeliness).
B. Obtaining the document (transmission media).
C. Breaking it down into usable portions.
D. Locating pertinent items within the document.
E. Reading the specific elements.

These letter designations are used in the following chart to indicate the topic, while numbers are used to show how many respondents ranked each item in the associated position, of the questionnaires received which had ranked that item.

	PROBLEM				
RANKING	A	B	C	D	E
1	22/38	7/38	5/37	4/38	1/37
%	57.9	18.4	13.5	10.5	2.7
2	10/38	14/38	8/37	4/38	2/37
%	26.3	36.8	21.6	10.5	5.4
3	2/38	8/38	12/37	7/38	8/37
%	5.3	21.1	32.4	18.4	21.6
4	2/38	4/38	6/37	18/38	7/37
%	5.3	10.5	16.2	47.4	18.9
5	2/38	4/38	6/37	5/38	19/37
%	5.3	13.2	16.2	13.2	51.4
1&2 %	55.2	84.2	8.1	21.0	35.1

APPENDIX A

QUESTIONNAIRE FORMAT

ATO Development/Dissemination

1. Rank the items below in order of difficulty which each presented to your unit. Use number one (1) for the MOST SIGNIFICANT difficulty.

a. Development of the ATO

____ Obtaining aircraft availability information
____ Obtaining target list/priorities
____ Obtaining allocation/apportionment guidance
____ Obtaining BDA information to guide retargeting
____ Requesting preplanned air support missions
____ Providing aircraft availability to higher HQ

b. Dissemination of the ATO

____ Obtaining the document (transmission media)
____ Receiving ATO in time to work it (timeliness)
____ Reading the specific elements (format)
____ Locating pertinent items within the document
____ Breaking it down into usable portions

2. For the TWO most significant difficulties in each area, briefly state what caused the problem to occur.

a. (1)

(2)

b. (1)

(2)

Enclosure (1)

APPENDIX A

QUESTIONNAIRE FORMAT

3. How did your unit overcome each problem?

a. (1)

(2)

b. (1)

(2)

4. What recommendations do you have to improve the ATO Development/Dissemination process for future joint operations?

5. Please provide any other information regarding ATO Development/ Dissemination which you believe is pertinent to this research project.

___ Mark here if you request that your identity remain confidential. A non-attribution policy will then be implemented.

Enclosure (1)

APPENDIX B

NAVY IDENTIFIED CTAPS LIMITATIONS

The CTAPS ATO software does not do the following:

- provide an ATO generation capability for USN/other services.
- meet requirements for JFACC afloat.
- support transfer of JFACC (ship-ship, ship-shore, shore-ship).
- support all USN missions (TLAM, UAV, etc).
- support LAN operations -- requires stand alone USAF hardware in addition to existing shipboard configurations.
- provide backward compatibility with previous software programs, (therefore requiring complete replacement/ reloading of systems).

These additional problems are also noted.

- There is only Air Force hardware and training support.
- Equipment is not readily available for distribution.
- CTAPS has a limited capability for two-way comm between JFACC and remote wings during ATO cycle.
- CTAPS limits access and manipulation of database information for wing level users.
- Connectivity to the Navy is limited to SHF and X.25 FTP, but a variety of comm paths are needed.
- ATOX is needed to convert CTAPS ATO to Navy compatible format.(44:15-16)

MARINE CORPS IDENTIFIED CTAPS LIMITATIONS

The following weaknesses were noted in the CTAPS system architecture.

- CTAPS has limited TADIL capability (TADIL A and B receive only; TADIL J planned).
- CTAPS has weak message processing and is not MTS capable.
- CTAPS has insufficient voice communications.
- The equipment has weak EMI and TEMPEST protection.
- The system requires twelve 3:1 ISO shelters.
- CTAPS is not a bonafide "program" as it hasn't gone through the acquisition process.
- CTAPS violates DoD Directive 5105.4 (6Dec90) for mapping standards.
- The CTAPS ATO Confirmation message format does not comply with Pub 6 of USMTF standards.(40:9)

APPENDIX B

MARINE CORPS IDENTIFIED CTAPS SOFTWARE CONCERNS

The Marine Corps has identified specific needs with respect to CTAPS ATO software applications, and believes that the Air Force should accomplish the following tasks.

- Ensure the software contains the required Application Program Interfaces (API) to support integration with other systems.
- Ensure software is not dependent on CMS. The software should be limited to information and data exchange, and not mapping or display capability.
- The only documentation costs to users should be reproduction costs. Documentation should be under the development contract.
- Software documentation should conform to DoD Standard 2167A rather than 7953A.
- Joint funding should be provided to support Engineering Change Proposals.
- Funding from services must not include costs for correcting System Trouble Reports.(44:14-15)

BIBLIOGRAPHY

1. Bethmann, R., Lieutenant Commander, USN. "Navy Command System (NCS) Status Report." Lapchart. Langley AFB: Space and Naval Warfare Systems Command, 15 Dec 1992.

2. Brann, R. W., Lieutenant Colonel, USMC. "Review of the Results of the 3-5 Feb 92 Joint Air Command and Control Seminar." Memorandum. Quantico: MCCDC, 12 Feb 1992.

3. CENTAF Marine Liaison. Desert Shield/Storm After Action Report. 18 Mar 1991.

4. CMC Washington DC, APP. "Air Tasking Order (ATO) Message." Message DTG 160007Z Oct 92

5. CMC Washington DC, AVN/C4I. "Contingency TACS Automated Planning System (CTAPS) Air Tasking Order (ATO) Software Joint Standardization Designation." Draft Message. Jan 1993

6. Commander Joint Task Force. "Tandem Thrust 92 After Action Report." Undated.

7. Commanding General, Marine Corps Combat Development Command. "Air Command and Control in Joint Operations Seminar." Quantico: MCCDC, 21 Apr 1992.

8. Cronin, W. R., Major, USMC. "C3I During the Air War in South Kuwait." <u>Marine Corps Gazette</u> Mar 1992: 34-37.

9. Department of Defense. "Joint Force Air Component Commander (JFACC) Concept of Operations for the U. S. Atlantic Command and Air Combat Command." Norfolk: USCINCLANT/ACC, 18 Sept 1992.

10. DiRita, L., Lieutenant Commander, USN. "Exocets, Air Traffic Control and the ATO." <u>U. S. Naval Institute Proceedings</u> Aug 1992: 63.

11. FMFLANT/II MEF. "USMC Designated as JFACC." JFACC Overview. Norfolk: FMFLANT, 14 Jan 93.

12. Fowler, D. E., Lieutenant Commander, USN. "CTAPS Standardization: Standard Air Tasking Order Software." Pentagon: C2 Systems Div., 15 Oct 1992.

13. Fowler, D. E., Lieutenant Commander, USN. Personal Interview, Pentagon. 30 Nov 1992.

14. Fromularo, J., Major, USMC. "Systems Integration, Interoperability." Lapchart. Quantico: MARCORSYSCOM, 12 Jan 1993.

BIBLIOGRAPHY

15. House Armed Services Committee. Desert Storm Aviation Study Team Memorandum for the Record. Myrtle Beach AFB: 20 Jun 1991.

16. House Armed Services Committee. "Desert Storm Lessons Learned." NAS Oceana; Aviation Study Team, 1 July 1991.

17. Hughes, D., "Electronic Systems Div. Accelerates New Systems Deployment, Upgrades." Aviation Week and Space Technology 4 Feb 1991: 58-59.

18. Hughes, D., "USAF Adapts Off-the-Shelf Computer Hardware, Software in New Systems." Aviation Week and Space Technology 3 Jun 1991: 72.

19. Johnson, D. J., and James A. Winnefeld. "Command and Control of Joint Air Operations: Some Lessons Learned from Four Case Studies of an Enduring Issue." Santa Monica: RAND (R-4045-RC), 1991.

20. Joint Chiefs of Staff. Joint Interface Operational Procedures (JIOP Joint Pub 3-56.24). Oct 1991.

21. Joint Chiefs of Staff. "Standard Air Tasking Order Software." Draft Memorandum. Pentagon, Undated.

22. Joint Chiefs of Staff, J6. "Contingency TACS Automated Planning System (CTAPS) Air Tasking Order (ATO) Joint Standard Designation." Message DTG 052045Z Jan 93

23. Kane, J. J., Captain, USMC. "ATO Standardization Paper." Camp Pendleton: Marine Corps Tactical System Support Activity, 24 Aug 1992.

24. Macedonia, M. R., Major, USA. "Information Technology in Desert Storm." Military Review Oct 1992: 34-41.

25. Marine Aviation Weapons and Tactics Squadron 1. "Sample MTF ATO Message." Undated.

26. Marine Corps Systems Command. "Marine Tactical Command and Control System." Lapchart. Quantico: MARCORSYSCOM, Aug 1992.

27. Miller. P. D., Admiral, USN. "U. S. Pacific Command/ U. S. Atlantic Command Joint Force Air Component Commander (JFACC) Concept of Operations." Memorandum. Norfolk: U. S. Atlantic Command, 8 Dec 1992.

BIBLIOGRAPHY

28. Moore, N. R. Jr., Lieutenant General, USMC. "Marine Air: There When Needed." U. S. Naval Institute Proceedings Nov 1991: 63-70.

29. Motz, D. R., Major, USMC. "JFACC: The Joint Air Control 'Cold War' Continues..." Marine Corps Gazette Jan 1993: 65-71.

30. Perla, P. et al. "Joint Force Air Component Commander (JFACC)." Pacific Command Trip Report (92-0164). Alexandria: CNA, 28 Jan 1992.

31. Perla, P., and Greg Swider. "Trip Report: Interview with Lieutenant General Horner, USAF" (CNA 92-0952). Alexandria: CNA, 2 Jun 1992.

32. Row, L. A., Captain, USMC, et al. "ATO Development/Dissemination Questionnaire." Quantico COS, CCSC-93 Group # 12, 1992.

33. Russ, R. D., General, USAF. "The Eighty Percent Solution." Air Force Magazine Jan 1991: 60-62.

34. Science Applications International Corporation. "CTAPS." Lapchart. 6 Jan 1993.

35. Science Applications International Corporation. "CTAPS and the Army." Lapchart. Hampton, Va. Sept 1992.

36. Shapiro, D. G. et al. "TEMPLAR (Tactical Expert Mission Planner) Design" DTIC Report (RADC-TR-84-134). Alexandria: DTIC, Jun 1984.

37. United States Air Force. "The CTAPS Concept." Information paper. Undated.

38. United States Air Force. "CTAPS/ATO Wire Diagram." Undated.

39. United States Air Force. "CTAPS Roadmap." Lapchart Draft. Langley AFB: ACC, 17 Jun 1992.

40. United States Government Printing Office. Joint Warfare of the U. S. Armed Forces (Joint Pub 1). 11 Nov 1991.

41. United States Marine Corps. "Advanced Tactical Air Command Central (ATACC)." Lapchart, 12 Jan 1993.

BIBLIOGRAPHY

42. United States Marine Corps. "ATACC, CTAPS and Theater Missile Defense Overview." Lapchart. Quantico: MARCORSYSCOM. Undated.

43. United States Marine Corps. "ATO Basic Information." FMFM 5-60 (Draft), 1 Jan 1993.

44. United States Marine Corps. "CTAPS." Information Paper. Quantico: MARCORSYSCOM, 10 Jan 1992.

45. United States Marine Corps. "CTAPS, ATO, ATACC." E-mail. Quantico: MARCORSYSCOM, 20 Nov 1992.

46. United States Marine Corps. CTAPS Conference Notes. Marine Corps Combat Development Command, Quantico, Virginia. 12 Jan 1993.

47. United States Marine Corps. "Data Comm for MTACCS." Lapchart. Quantico: MARCORSYSCOM, Aug 1992.

48. United States Marine Corps. "JFACC ATO Cycle." MCLLS No. 61937-14534. Quantico: Studies and Analysis Branch, Undated.

49. United States Marine Corps. Marine Aviation and the Air Component Commander." Lapchart. Undated.

50. United States Marine Corps, Communication Officers School. "Air Tasking Cycle." ACE Subcourse Handout, 1992.

51. United States Marine Corps, Marine Corps Lessons Learned. Studies and Analysis Branch, MCCDC Quantico, Virginia. Various Dates.

52. Walsh, P. J. et al. Institute for Defense Analyses. Personal Interview, Alexandria. 28 Jan 1993.

53. Wigge, M. A., "A Review of Joint Doctrine Regarding JFACC and the Air Tasking Process." Center for Naval Analyses Working Paper (92-0932). Alexandria: CNA, 29 May 1992.

MARINE CORPS UNMANNED AERIAL VEHICLES: LET'S DO IT RIGHT

Submitted to
Major C.J. Conlan
and Ms. Lloyd-Stanger
at the Communication Officers School
Quantico, Virginia

Captain Mike Ahern USMC
Captain Pat Coronado USMC
Captain Todd Scott USAF
Captain Jeff Stansfield USMC

8 April 1993

MARINE CORPS UNMANNED AERIAL VEHICLES: LET'S DO IT RIGHT

OUTLINE

THESIS: In order to maximize efficiency and effectiveness of UAVs, the Marine Corps must strive to keep its current Short Range (SR) UAV system and must also promote the consolidation of Close Range (CR) and SR UAV systems at the RPV Company of the Surveillance, Reconnaissance, and Intelligence Group.

I. Development of UAVs in support of the military.

   A. UAVs key advantages over manned aircraft are survivability and expendability.
   B. The critical factors for the Marine Corps have always been size and lift requirements.
   C. In January 1986, the Navy selected the Pioneer as its Short Range UAV.
   D. The Joint Programming Office was formed to oversee the development of interoperable systems.

II. Pioneer: The Marine Corps UAV

   A. Since 1986 Pioneer has established an outstanding performance record.
   B. The Pioneer's major drawback is its relatively short endurance time.
   C. Pioneer would benefit from an improved communications payload.

III. Hunter: Replacement for the Pioneer?

   A. The Hunter has better endurance than the Pioneer.
   B. Hunter requires almost twice the lift as Pioneer.

IV. EXDRONE: The Marine Corps' Close-Range UAV

   A. The EXDRONE is a small, simple system.
   B. EXDRONE'S drawbacks are light payloads and limited endurance.

V. How the Marine Corps should organize UAVs

   A. Fielding EXDRONES at the battalion level could be disastrous.
   B. Airspace management would be an overwhelming problem.

VI. Problem of Manning

A. Secondary MOS's should be given to qualified operators, internal pilots, and mission commanders.
B. The Marine Corps must find a way to access the pool of experienced UAV personnel.
C. Maintenance and supply problems will be extensive if CR UAVs are fielded at battalions.

VII. Recommendations for the future

A. Keep the Pioneer until a viable follow-on platform becomes available.
B. Establish a solid UAV MOS tracking system within the Marine Corps.
C. Consolidate CR and SR UAVs within the RPV Companies.

MARINE CORPS UNMANNED AERIAL VEHICLES: LET'S DO IT RIGHT

A better knowledge of the enemy's disposition of forces and his order of battle has always been fundamental to successful combat operations. Today's combat commander places a high premium on reconnaissance systems that provide real and near real-time imagery intelligence. This information is invaluable because it provides the operational commander with a significant warfighting advantage--the ability to formulate effective battle plans and to respond almost instantaneously to enemy actions on the battlefield.

Unmanned Aerial Vehicles (UAVs) hold vast potential for the future, but there are many challenges ahead for the Marine Corps' UAV program. UAVs yield significant manpower savings and enhance the performance and capabilities of Marine operating forces. Additionally, they are cost effective and extremely versatile. In order to maximize efficiency and effectiveness of UAVs, the Marine Corps must strive to keep its current Pioneer system, and must also promote the consolidation of Close Range (CR) and Short Range (SR) UAV systems within the Remotely Piloted Vehicle (RPV) Company of the Surveillance, Reconnaissance, and Intelligence Group (SRIG).

Presently, the services are at a critical point in UAV development. The Marine Corps currently employs the CR EXDRONE and the Pioneer. The SR Hunter system is presently scheduled to replace the Pioneer. The Marine Corps must examine and consider the fielding of the follow-on SR UAV system, the Hunter. The fielding of the Hunter system presents many challenges. Many of the Fleet Marine Force (FMF) are proponents for the continued use of the Pioneer SR UAV system vice the Hunter. The Marine Corps must consider at what level to hold the SR and CR UAV systems, and decide how to handle training and maintenance problems as well as airspace management concerns. This paper will compare the SR Pioneer and Hunter systems and will also examine the CR EXDRONE system. It will further make recommendations for the Marine Corps' direction based on the needs of the users.

DEVELOPMENT OF UAVS IN SUPPORT OF THE MILITARY

Joint Chiefs of Staff Publication 1 defines a UAV as an unmanned air vehicle capable of being controlled by a person from a distant location through a communication link. (13:1-1) UAVs are force multipliers; they deliver the capability to find and track targets and provide information that allows forces to destroy enemy assets more efficiently. These missions can be performed by manned aircraft, but the cost associated with losing a manned aircraft to anti-aircraft weaponry far outweigh those of losing an unmanned platform.

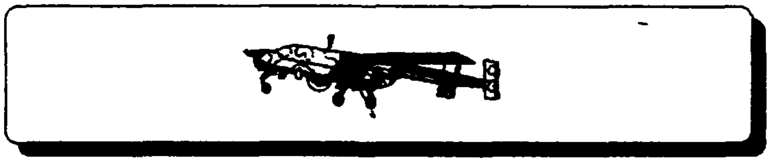
(28:41) Additionally, UAVs have smaller cross sections that make them more difficult to detect. So, while UAVs encounter the same threats faced by manned aircraft, survivability and expendability are their key advantages.

Recognizing the value of UAVs, the Marine Corps, in conjunction with the Navy, began to monitor UAV programs and activities during FY82-FY83. The Navy procured eight Mastiff UAVs in FY84 for approximately $8 million and the Army concurrently developed the Aquila UAV. The Marine Corps rejected the Aquila because of its large logistical requirement, which they considered incompatible with the Marine Amphibious Force's most probable mission of third world beachhead landings. (29:257) This rejection is a significant point of interest because it reflects the FMF's current attitude toward the Hunter. For the Marine Corps, the size and lift requirements were critical factors in the early procurement of UAVs. Essentially, these requirements have not changed for the Marine Corps, and size and lift are still pivotal considerations.

Because of this keen interest in UAVs, the Pentagon initiated a ROADMAP program in the summer of 1985. This program, designed to categorize UAVs by range capabilities, led to the elimination of many other programs that were being considered. The Navy, for instance was given the responsibility for short range, medium-range, and long range

UAVs, while the Army's responsibilities centered on the Aquila.

In July 1985, the Navy outlined desired UAV specifications and subsequently held a competition. The Navy tested and evaluated systems to determine the best platform that fit unique needs of the Navy and the Marine Corps. Specifically, the Marine Corps needed a system that did not require a large logistical support train and could be operated by a relatively small crew. Additionally, the platform had to possess the capability to perform the required missions of artillery target acquisition/determination, naval gunfire adjustments, and battlefield surveillance in urban and conventional land warfare. (29:257, 269) Today's needs are basically the same as those of 1985. Finally, in January 1986, the Navy announced that it had selected the Israeli's Pioneer as its system. Mazlat, the Israeli producer, received a contract for over $25 million for the production of three Pioneer systems. The Marine Corps presently fields the Pioneer UAV as its primary ground-launched, UAV platform. (Shown in Figure 1)



PIONEER UAV, PRODUCED BY ISRAEL AIRCRAFT INDUSTRIES LTD

FIGURE 1

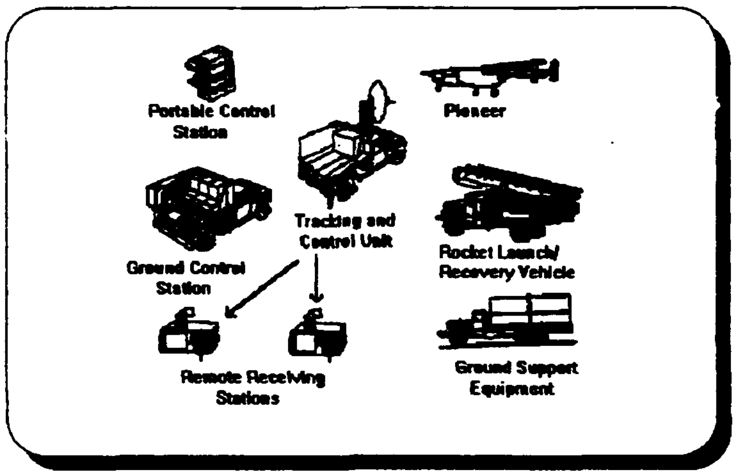
Currently, the responsibility for testing and evaluating follow-on UAVs lies with the UAV Joint Project Office (JPO) located at Pentagon City, Virginia. The Department of Defense (DOD) formed the JPO after Congress directed that an annual Master Plan be prepared to ensure that common and interoperable systems were being developed for all the services. The JPO's stated mission is to "expeditiously field quality UAV systems that provide a significant tactical advantage to the operational commanders." (29:1) The JPO is the Department of Defense's center of focus for UAVs. The JPO provides advice and guidance to other federal agencies interested in employing UAVs and provides joint funding for research, development, and procurement. However, the services provide their own funding for operations and maintenance (O&M) costs that include replacing attrited air vehicles.

PIONEER: THE MARINE CORPS' UAV

The Pioneer has a proven and well-respected performance record. Introduced to the force structure in 1986, Pioneers have operated from four battleships during deployments worldwide. Six Pioneer systems participated in Operation Desert Storm--three with 1st Marine Expeditionary Force, two with United States Navy battleships, and one with United States Army VII Corps. (29:59) During the Gulf War, the Pioneer systems provided near real-time reconnaissance, surveillance, target acquisition, artillery spotting, and Bomb

Damage Assessment during both day and night operations. (29:9)

Ideally, each system consists of eight air vehicles, a ground control station (GCS), two portable control stations, two remote receiving stations, launch and recovery equipment and transportation vehicles. (29:257, 269) (As shown in Figure 2)



PIONEER SYSTEM

FIGURE 2

However, due to real world constraints, damaged airframes and termination of production, the Marine Corps' RPV Companies often operate at levels below the specified table of equipment.

Pioneer has limitations; these were evident in Desert Storm. The system did not have the desired range or endurance required for all operations. For instance, Army VII Corps needed a system with a radius of action of about 300 kilometers and a time on station in excess of four hours at

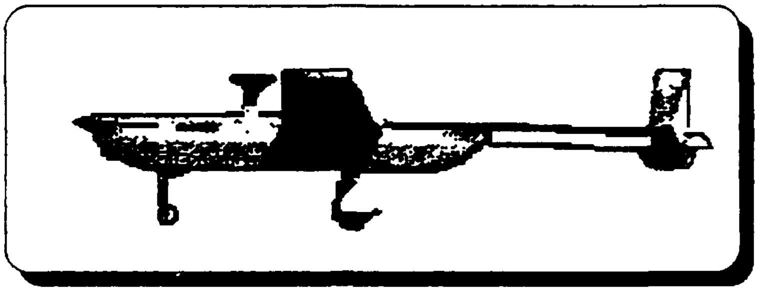
maximum range. (29:60) Characteristically, Pioneer has a maximum range of 185 km and an endurance time of four hours. (2:3) The Army needed a system with more capabilities. Pioneer's range was generally satisfactory for the USN and USMC, but additional endurance would have been welcomed.

Pioneer could benefit from a better communications payload. Presently, Pioneer can use HF, VHF, and UHF bandwidths, but because of the vast distances at which UAVs operate, the line of sight communications range is often exceeded. For example, during Desert Storm, communication links were unreliable because of long distances. This meant Pioneer could only provide limited information. An example of this was when 2nd RPV Company was put in direct support of the division. According to Major Brennan, the G-2 for 2nd Marine Division:

> While in direct support of the division, the 2d RPV Company liaison team was habitually unable to establish positive communications with company headquarters, seriously hampering coordination of flight activity and timely reporting of information. (18:28)

HUNTER: REPLACEMENT FOR THE PIONEER?

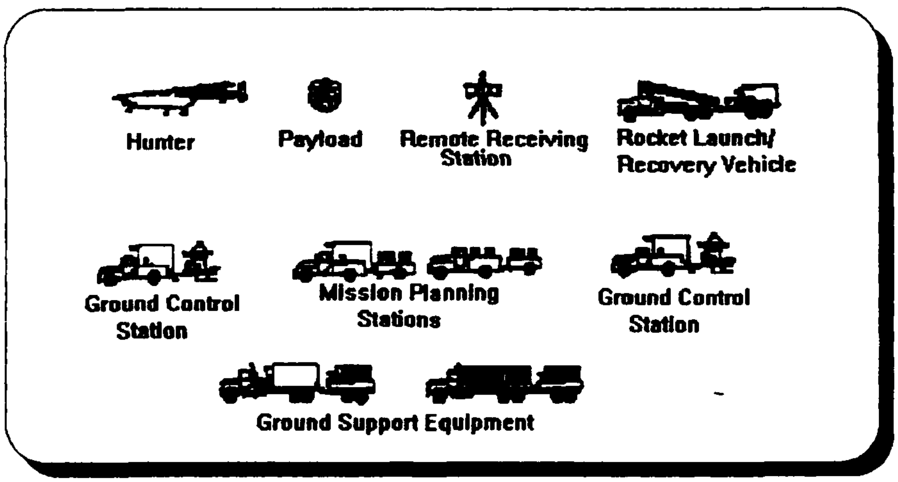
In many ways, Hunter is a more capable system than Pioneer. Hunter has a maximum range of 150 kilometers beyond the Forward Line of Troops (FLOT), an eight hour range, and Global Positioning System (GPS) navigation capability. (15:3) (2:5)(Figure 3)



HUNTER, PRODUCED BY ISRAEL AIRCRAFT INDUSTRIES LTD. AND TRW

FIGURE 3

However, Hunter is a very large system. The Hunter system consists of a Mission Planning and Control Station, which includes one mission planning station and two GCSs; remote video terminals; eight air vehicles; modular mission payloads; ground and air data terminals; launch and recovery equipment; and integrated logistics support. (29:12) (As shown in Figure 4)



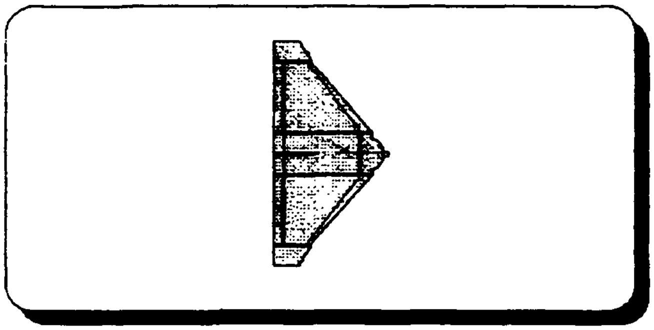
HUNTER SYSTEM

FIGURE 4

An additional GCS will provide a greater communications capability, but will also increase lift and logistical requirements. The Hunter air vehicle is almost twice the size as the Pioneer and weighs three times as much. (22:2) Four C-5s and two C-141s are required to lift an RPV Company using Hunter; Pioneer requires only two C-5s and three C-141s. Pioneer has already been dropped from some exercises because of its large airlift requirement. (2:2) Yet the Marine Corps is contemplating acquiring the significantly larger Hunter.

EXDRONE: THE MARINE CORPS' CLOSE-RANGE UAV

During Desert Storm, EXDRONE was used successfully to augment the Pioneer. It was employed to support battalion and higher sized units. It has a range of 50 kilometers beyond the FLOT, carries a 25 pound payload, and has an endurance of two and a half hours; it is a relatively small system that requires a 2-3 man team to operate. (29:47,48) During Desert Storm, its smaller cross section made it more difficult to detect. Because EXDRONE is inexpensive, it is intended to operate in areas where it is reasonable to expect air vehicle losses. EXDRONE is expendable when the mission requirements override equipment survivability considerations. In most cases, however, the CR UAV will be recovered after mission completion. (31:5) (Figure 5)



EXDRONE UAV, PRODUCED BY BAI AEROSYSTEMS, INC.

FIGURE 5

Although EXDRONE is a valuable and affordable asset, it has many limitations. It has a day-only camera with no zoom capabilities or variable field of view. This means that the airframe must be maneuvered and adjusted to obtain the best picture, which reduces the effectiveness of the EXDRONE. However, adding a gimbaled payload, Forward Looking Infrared Radar camera and a zoom capability will add a significant amount of weight, probably superseding the airframe capabilities. Another limitation of EXDRONE is its lack of automatic navigation. The operator is dependent on locating terrain features to orient himself as to where the aircraft is flying. (17:46)

HOW THE MARINE CORPS SHOULD ORGANIZE UAVS

The current plan will deliver 14 SR Hunter systems and 136 CR EXDRONE systems to the Marine Corps by FY96. (20:1,2) Some Hunter assets will reside with the RPV Companies and some assets will be for wartime reserves and maritime

prepositioning. The Marine Corps will field EXDRONE at the RPV companies and at the battalions, with additional assets going to the wartime reserves and maritime prepositioning. (31:3, 32:3)

The fielding of CR UAVs at the battalion and battery levels could be disastrous. In this situation, airspace management becomes a monumental problem. From an aviation command and control standpoint, having air platforms launched, controlled and recovered autonomously at a battalion level would be exceedingly dangerous. Fielding systems at the battery and battalion levels would most likely saturate the division's close-in air space and present tremendous air space and frequency coordination problems that the division could not handle.

This concept is similar to placing tactical aircraft such as AV-8s and AH-1s in direct support of battalions. Giving a battalion the asset to employ as it sees fit is an attractive concept because it facilitates flexibility and response time. Conversely, it creates an unsafe situation without centralized control of air assets without deconfliction with other aircraft and supporting arms. The planning, coordination and execution of these air vehicles at the battalion level are major safety concerns. Detailed command, control and communication procedures must be established; otherwise, the lives of Marines will be jeopardized.

THE PROBLEM OF MANNING

With a shrinking monetary budget and changing worldwide threats, the Marine Corps must ensure that a solid plan is developed that most efficiently and effectively employs Marine Corps UAVs. A critical part of this plan is manning. A secondary Military Occupational Specialty (MOS) for officers and enlisted who have UAV experience has already been created, but the Marine Corps needs to ensure that a system is in place to track these individuals.

With plans to accept the Hunter UAV into Marine Corps inventory as early as FY94, the Marine Corps must establish a solid concept of operations with emphasis on minimizing manpower, training and O&M costs. The Marine Corps must look at all levels of usage, maintenance and supply within the Marine Corps to develop this plan. The mission and tasks required must not be jeopardized, and manning plans must take into consideration a more sophisticated threat and a technologically advanced environment. Fielding systems at the battalion level without appropriate manpower to dedicate to a skill intensive system would be self-defeating. (30:17) The training and experience of personnel can be maximized by placing UAVs in the RPV Company,. The current plan for the CR UAV system identifies an increase of three personnel at the regimental level with additional operators/maintainers coming "out of hide" from organic assets. (29:4) This concept will

not optimize training or personnel or maintenance of the systems. By consolidating both the CR UAV and SR UAV in the same unit, the Marine Corps can build on the commonality and interoperability of the systems for training, safety, and maintenance. This consolidation must include appropriate MOS tracking.

RECOMMENDATIONS FOR THE FUTURE:

CONSOLIDATION OF UAVS AT RPV COMPANIES

It is extremely prudent to consolidate CR and SR UAVs at the RPV Company where standard maintenance, safety, and training procedures already exist. If the Marine Corps stays with the current plan to train operators and maintainers from "out of hide," Marines in these units will have to undergo specialized maintenance and operator training in addition to training in their specific (MOS). The battalions can train "out of hide" operators and maintainers, but it will be difficult and costly. By not consolidating, different safety and maintenance efforts will most likely develop leading to fragmented programs and a potentially wasteful endeavor. This consolidation will not prevent the lower echelons from receiving the support they need. Task organized detachments of CR and SR UAVs will be employed to best support these units based on specific requirements.

Additionally, consolidation of UAVs at the RPV Company will simplify airspace management. All coordination measures

and control procedures should be maintained by the company and should be coordinated with the appropriate Marine Air Command and Control System agency. All measures and procedures must be included in the annex M portion of the Operations Order and in the Pilot Controller Handbook. Further, all missions should be treated as any manned aircraft flight and included in the daily Air Tasking Order with pertinent Special Instructions annotated. If CR UAVs are held at battalion and battery level, this information would not be timely and airspace management would be a nightmare. The chances for midair collisions would increase exponentially.

UAVs owned by the battalion may be more desirable for the battalion commander, but this plan will significantly diminish the MAGTF commander's control of his assets and the overall mission. Finally, fielding UAVs at the battalion level would eliminate the Marine Air-Ground Task Force Commander's flexibility in tasking UAVs. The platforms would be out of his hands and could not be quickly diverted for higher priority missions.

ESTABLISH A MOS TRACKING SYSTEM

Resident expertise in the UAV community is a current problem. Currently, secondary MOS's are assigned to qualified mission commanders, internal pilots, and operators. However, there is no mechanism in place to adequately track these individuals after they are transferred from an RPV Company.

This vast wealth of knowledge is lost and new personnel must relearn those lessons that were learned by previous personnel.

This is not to say that individuals possessing a UAV related MOS will constantly be reassigned to RPV Companies. Instead it will merely give the Marine Corps a pool of skilled personnel from which to draw in time of need. Therefore, we recommend that the Marine Corps develop an efficient system to properly track those Marines with the critical low density skills required for UAV operations. This is applicable for both officers and enlisted Marines. Peacetime RPV Companies should be manned by adequate numbers of trained personnel. In times of need, additional Marines with prior UAV expertise could be located quickly and subsequently assigned to RPV Companies.

CONTINUED USE OF THE PIONEER SYSTEM

The Marine Corps should extend the current life cycle of the Pioneer System. The follow-on SR UAV, the Hunter, is too big for the Marine Corps. Although it incorporates many of the desired capabilities requested in a follow-on system to the Pioneer, its size is prohibitive.

If the Marine Corps keeps Pioneer, a logistical support system must be implemented to allow the system to continue to operate. Currently, there is not an aviation supply system in place to support Pioneer's needs. When replacement parts for UAVs are not available, units are often forced to cannibalize

other vehicles to keep a minimum number of UAVs flying. This is unacceptable.

Therefore, it is highly recommended that the Marine Corps continue to field the Pioneer system as the primary SR UAV. The Marine Corps should continue to develop and upgrade the Pioneer system with off-the-shelf technology until an appropriate follow-on platform that meets the Marine Corps needs becomes available.

BIBLIOGRAPHY

1 Bunker, LtCol. W. R. "Remotely Piloted Vehicle Payloads." USMC letter, October 2, 1987.

2 Concept of Employment for the Unmanned Aerial Vehicle-Short Range (UAV-SR). Undated.

3 Concept of Employment for the Unmanned Aerial Vehicle-Close Range (UAV-CR). Undated.

4 Dickerson, Capt. D. L., Herring, CWO2 J. G., Weichman, Capt. J. R. "Unmanned Aerial Vehicles (UAV's)-Make The Right Choice." Professional notes, October 27, 1992.

5 Fleet Marine Force Organization, 1992. USMC FMFRP 1-11, Chapter 7.

6 Fulghum, David A. "Anti-Scud Role Weighed for UAVs With SDI Weapons and Sensors." Aviation Week & Space Technology, March 2, 1992.

7 Fulghum, David A. "Gulf War Successes Push UAVs Into Military Doctrine Forefront." Aviation Week & Space Technology, December 9, 1991.

8 Fulghum, David A. "Pentagon Selects TRW/IAI Hunter To Fill Short-Range UAV Requirement." Aviation Week & Space Technology, July 6, 1992.

9 Fulghum, David A. "UAVs Pressed Into Action To Fill Intelligence Void." Aviation Week & Space Technology, August 19, 1991.

10 Garret, W. B. "Unmanned Aerial Vehicle-Close Range System Requirements and Fielding with enclosures." USMC correspondence, October 16, 1992.

11 Gerken, Louis. UAV-Unmanned Aerial Vehicles. U.S.A.: American Scientific Corp., Chula Vista, CA, 1991.

12 "Gulf War Prompts Improvements In Next Generation of UAVs." Aviation Week & Space Technology, December 9, 1991.

13 Hardeman, Major A.J., Commanding Officer, 3rd RPV Company. "Future Marine Corps Utilization of the Pioneer UAV Systems." USMC letter, October 27, 1992.

14 Hines, Capt. M. "RPV Operations at CAX 9-92." Marine Corps Lessons Learned (MCLLS), September 14, 1992.

15 Holzer, Robert and Leopold, George. "U.S. Marine Corps Seeks Interim UAV." Defense News, January 18-24, 1993.

16 Howard, Major T. "Unmanned Aerial Vehicles." USMC letter, August 22, 1991.

17 Joint Tactics, Techniques, and Procedures For Unmanned Aerial Vehicles. Joint Chiefs of Staff Joint Pub 3-55. Undated.

18 Leopold, George. "U.S. OKs More Short-Range UAVs." Defense News, January 18-24, 1993.

19 Lindblom, S. E. "Unmanned Aerial Vehicle-Close Range System Requirements and Fielding." USMC letter, October 6, 1992.

20 MCLLS Reports (Approx. 100 reports from 1989 - 1991).

21 Nordwall, Bruce D. "U.S. Relies on Combination of Aircraft, Satellites, UAVs for Damage Assessment." Aviation Week & Space Technology, February 4, 1991.

22 O'Donnell, J. P. "Unmanned Aerial Vehicle Manning Requirements". Undated.

23 Opal, Barbara. "Pentagon Red Tape Delays UAV Award." Defense News, December 21-27, 1992.

24 Pratt, Capt. Alan M. "The Pioneer UAV: Do We Need a Follow-On?" Marine Corps Gazette, April, 1992.

25 Remotely Piloted Vehicle Employment. USMC Operational Handbook 2-2, April 1987.

26 "RPVs/Drones/Targets." DMS.

27 Scott, William B. "Miniature SAR Systems-Mounted on Unmanned Vehicles Offer Battlefield Commanders Real-time Imagery." Aviation Week & Space Technology, December 9, 1991.

28 "Short-Range Prototypes May Provide Core for Next Generation of UAVs." Aviation Week & Space Techology, December 9, 1991.

29 Tice, Brian P. "Unmanned Aerial Vehicles, The Force Multiplier of the 1990s." Airpower Journal, Spring 1991.

30 Twenty-second MEU. "UAV Close-Range Fielding Plan." USMC message, October 19, 1992.

31 "Unmanned Aerial Vehicles (UAV) Master Plan, 1992." DOD, April 15, 1992.

32 "Unmanned Aerial Vehicle-Close Range System Requirements and Fielding." USMC message, October 21, 1992.

BAILING WIRE, BUBBLE GUM, TIN CANS & STRING: THE MARINE CORP'S FORWARD COMMAND POST

Submitted to:
Major Conlan
and
Ms. Lloyd-Stanger
For the Command and Control Systems Course
Communications Officers School
Quantico, Virginia

by
Captain K. M. Gill, USMC
Captain M. E. Brown, USAF
Captain F. Montgomery, USA

8 April 93

EXECUTIVE SUMMARY

Title: **BAILING WIRE, BUBBLE GUM, TIN CANS & STRING: THE MARINE CORP'S FORWARD COMMAND POST**

Authors: Captain Kenyon M. Gill III, United States Marine Corps
Captain Freddie Montgomery, United States Army
Captain Michael E. Brown, United States Air Force

Thesis: The standard command post for a Marine infantry unit is foot mobile. There has never been a doctrinal C^2 (Command and Control) platform or vehicle in the infantry at the battalion, regiment, or division level, other than an attached AAVC7A1 from the AAV Battalion. History reveals all units struggling to create "jerry-rigged" command vehicle configurations using their organic jeeps, HMMWVs, MRC vehicles and trucks. The most logical choice for a "standardized " command and control vehicle in the Marine Corps' current inventory is the $LAVC^2$.

Recommendation: Standardize the Marine Corps' forward command posts and replace "jerry-rigged" command and control vehicles with the $LAVC^2$.

BAILING WIRE, TIN CANS & STRING: THE MARINE CORP'S FORWARD COMMAND POST

OUTLINE

Thesis: The standard command post for a Marine infantry unit is foot mobile. There has never been a doctrinal C^2 (Command and Control) platform or vehicle in the infantry at the battalion, regiment, or division level, other than an attached AAVC7A1 from the AAV Battalion. Many units have struggled to create "jerry-rigged" command vehicle configurations using their organic jeeps, HMMWVs, MRC vehicles and trucks. The most logical choice for a "standardized" command and control vehicle in the Marine Corps' current inventory is the $LAVC^2$.

I. Problem.
   A. The solution to non-standardized forward command posts is the $LAVC^2$.
   B. German forward command concept should be basic tenant of Marine Corps' maneuver warfare.

II. Current forward command post employment.
   A. Employment of $LAVC^2$s in LAI Battalion.
   B. Employment of $LAVC^2$s in South West Asia.
   C. An alternatives to the $LAVC^2$; the "MRC-C^2".

III. Proposed solutions
   A. Proposal one: Organic $LAVC^2$s to the GCE.
   B. Proposal two: Organized general support $LAVC^2$s to the GCE.
   C. Proposal three: Organic $LAVC^2$s and MRC-C^2s to the GCE.

IV. The mechanics.
   A. Support required for the $LAVC^2$s.
   B. Personnel required for the $LAVC^2$s.
   C. Maintenance required for the $LAVC^2$s.
   D. Costs of $LAVC^2$s.
   E. Improvements needed in the $LAVC^2$.

V. The Authors choice for best solution is Proposal One.

BAILING WIRE, BUBBLE GUM, TIN CANS & STRING: THE MARINE CORP'S FORWARD COMMAND POST

Armed conflicts require command and control at echelons from the lowest to highest levels of war. A command and control system is essential to the successful execution of armed conflicts. Forward command and control must be an integral part of the Marine Expeditionary Force (MEF) if we are to exploit the essence of maneuver warfare.

THE PROBLEM

The standard command post for a Marine infantry unit is foot mobile. There has never been a doctrinal command and control (C^2) platform or vehicle in the infantry at the battalion, regiment, or division level, other than an attached AAVC7A1 from the Amphibious Assault Battalion. All units have struggled to create "jerry-rigged" command vehicle configurations using their organic jeeps, HMMWVs, MRC vehicles and trucks.

It is apparent to the Marine Corps that a standardized main and rear command post (CP) is necessary for future sustained operations. The Marine Corps has put forth great effort in the development of a standardized command post configuration that will meet the needs of the commander and staff. The three divisions within the Marine Corps met Dec. 2, 1992 at Camp Lejeune, North Carolina to draft a standardized command post

configuration for division headquarters staff that will be more organized and efficient. This is a tremendous step towards attaining efficiency within unit command posts and the Corps. Although the combat operations center (COC) configurations will be standard, no steps have been taken to standardize a mobile command and control platform. "Jerry-rigged" C^2 vehicles will continue to be standard operating procedure (SOP) until action is taken to standardize the mobile command post.

In today's wartime environment, Marine Air Ground Task Force (MAGTF) commanders should not be without the light armored vehicle command variant ($LAVC^2$). This vehicle is the safest and most reliable platform Marine Corps commanders can use to traverse the battlefield while communicating with and visualizing their lead forces.

Even with an uncertain and new Marine Corps force structure, there is an absolute requirement to identify and field a standard command and control platform within the Fleet Marine Force (FMF) as a forward command post. The geometry of modern battlefields has changed. As more units and personnel are added to the theater of operations, lines of communications are stretched past their limits. Without forward communications, the commander will lose contact with his forces. Messengers, signal flags, and communications equipment have continually been developed to better provide the commander with the ability to control his forces. Ground forces are now spaced farther apart due to an

increased number of accurate weapons while offensive units are continuously in motion looking for and exploiting surfaces and gaps. Our concepts of war at the tactical and operational levels now center around maneuver. The dynamics of future battles will continue to increase weapons lethality, mobility, information as a combat multiplier, tempo of actions, joint operations and size of forces. Plans and their execution are increasingly more difficult. We must find and use every available tool to increase a commander's ability to act decisively.

THE SOLUTION

The $LAVC^2$ is the instrument that commanders need to fulfill their requirement for a highly mobile forward command post. Doctrinally, $LAVC^2$s should be employed by units that possess LAVs such as light armored reconnaissance (LAR) and combined arms regiment (CAR). Additionally $LAVC^2$s should be employed by units that do not currently have a "standard C^2 platform" to use as their forward command post.

The ability to lead from a forward position is essential in maneuver warfare. A commander requires a vehicle that can take him forward in battle and not restrict him to the main CP. If his forward CP does not support reliable communications, the commander will not move forward. Operating communications equipment demands routine training and familiarity to stay knowledgeable and proficient. Unfamiliarity of equipment breeds

confusion and task saturation. Exercises will often succeed even though communication is poor; however, poor communications in war kills troops. Smart commanders will not exceed their span of control or communications range. (6:29) Communications can either support or cripple the commander depending on how he chooses to employ his equipment.

THE HISTORY OF THE FORWARD CP

The German Army validated the concept of forward command during WWII. German Field Marshal Rommel exercised forward command, and it became an important combat multiplier. Forward command was the standard tactical command and control style in the Wehrmacht. The Germans believed that "forward command" was crucial for tactical victory in maneuver warfare. They called for "Senior commanders to issue orders based upon personal observation and to assume command of a subordinate unit, if necessary, during a critical point in the fighting." (1:26) The Germans tried to make decisions at the lowest possible level of command. Their decision-making process provided the flexibility necessary for commanders to think and act more quickly than the enemy. (1:27)

By leading from the front, sensing the situation, and taking decisive action without waiting for permission or further instructions, German commanders were able to routinely act faster than their opponents. The high speed tempo and dynamic

nature of *"Blitzkrieg"* called for command and control to be immediate and decisive. This style of command and control dictated battlefield commanders to traverse the front lines visualizing events as they unfolded, giving them a better feel of the battle. (4:29) Commander indecision was considered unexcusable by the Wehrmacht leaders. Blitzkrieg warfare put enormous pressure on the field commanders to perform with precise accuracy. Centralized control by higher headquarters was undesirable and unacceptable. Forward command allowed Wehrmacht leaders to think and make their own decisions while maintaining the intent and objectives of German higher headquarters. (1:27)

The forward command approach to C^2 was a major reason for German tactical successes. Field Marshal Von Manstein relates:

> *Divisional operations were conducted from the forward position on the battlefield. The division commander had his place within the Schwerpunkt group which was to make the main effort. He visited the regiments several times a day. The divisional headquarters was somewhat farther back and did not change its location during operations.* (2:11)

"History proves that thinking, independent minded tactical leaders of the Wehrmacht consistently outfought their opponents. That Wehrmacht fought almost everywhere outnumbered, often in hopeless situations, and never disintegrated. The Wehrmachts' achievements are strong arguments for the prowess of their tactical abilities." (1:28)

Field Marshal Von Manstein related successful maneuver warfare operations to how well he could see the battlefield. The Germans forward command post approach to command and control should be a basic tenant of Marine Corps maneuver warfare. One of the most important elements of maneuver warfare is the ability of the commander to see and understand the battlefield. Eighteenth-century military experts recognized this concept and named it "Coup d'oeil." This concept, if properly employed, can aid the commander in achieving decisive results by visualizing and exploiting the enemy's weakness, and striking before the enemy can react. Today more than ever, a commander must have the capability to conceptualize the battlefield. The management tool he needs is the forward command post.

CURRENT LAVC^2 EMPLOYMENT

The system that we employ must allow the commander to operate flexibly, delegate authority, and lead from any point on the battlefield. At the same tine it must not deprive him of the ability to respond to the changing face of the battle. The ultimate and only meaningful measure of command and control is whether the force functions more effectively and quickly than the enemy. Equipment alone will not solve a command and control problem. Communications equipment can only facilitate control of a force. It takes a leader to command. Control measures, whether they are SOP's, battle drills, or communications, give the commander the tools to command. The quest for information should

and control. The $LAVC^2$ cannot solve every C^2 problem, but it will increase a commander's ability to take decisive action and better control the tempo of the battle.

A forward command post is established when the commander needs to move forward to direct the current battle or to directly influence some aspect of the battle. The forward command post must be mobile and small. The standard configuration will employ a commander, operations officer (G/S-3), intelligence officer (G/S-2), fire support coordinator, and communications technicians as required. Operational Handbook (OH6-1) states: "Commanders must have the ability to lead from these forward observation posts or from forward visits to line units."

The forward command post must be able to move quickly from the main command post. A commander cannot afford to wait for a forward command post to be taken from the command post's assets. The forward command post must allow the commander enough control to displace his main command post. At the main CP the forward command post must be in a "stand by" mode in order to give the commander the freedom to exercise forward command.

The $LAVC^2$ is a high-speed, reliable command and control platform. It provides the commander with a safe reliable platform to give guidance, allocate resources, position forces, and synchronize assets from a forward position. This eight-wheeled vehicle, capable of speeds of over 60 mph, provides

platform to give guidance, allocate resources, position forces, and synchronize assets from a forward position. This eight-wheeled vehicle, capable of speeds of over 60 mph, provides its occupants armored protection against small arms fire. Most importantly, it provides the commander with one UHF radio and four VHF radios.

The $LAVC^2$ is currently employed in the divisions by the light armored reconnaissance (LAR) battalion. This division level reconnaissance battalion has only eight $LAVC^2$s. The battalion employs the vehicles at 100% during operations without any backup vehicles. The commander has two $LAVC^2$s at the main command post, two at the rear (alternate) command post, and one with each of the line companies. Unlike a straight leg infantry company commander, the mobile LAR company commander does not have the ability to communicate with the artillery observer, mortar observer, forward air controller, and naval gunfire spotter. The $LAVC^2$s are necessary at the company level to provide the company commander with the ability to call for and coordinate fire support assets. The two $LAVC^2$s at the battalion main and rear (alternate) command posts do not provide all communications required. MRC-110s (VHF single channel radio) and MRC-138s (HF single channel radio) are also at the command posts to guard all of the additional radio circuits. The "$LAVC^2$ gives the commander agility on the battlefield, while maintaining the critical circuits for command and control. LAR Battalion

commanders have capabilities that should be exploited by all commanders at every level within the Ground Combat Element (GCE).

LAVC² EMPLOYMENT IN SWA

After action reports from Desert Storm hailed the LAVC² as a superb forward command post. (5) Both the 2nd Marine division Commanding General (CG), Lt. Gen. Keys, and I MEF CG, Gen. Boomer, have personally endorsed the LAVC²'s use as the Marine Corps' best choice for a forward command post. Detaching the LAVC²s from LAR Battalion would degrade the LAR Battalion's ability to fight as they train. We must recognize the need for additional command variant LAVC²s. Units that would be immediately and positively impacted by the addition of LAVC²s are the divisions, Marine Expeditionary Forces (MEFs), and Marine Expeditionary Units (MEUs).

Within the division, the additional LAVC²s need to be employed at the division forward command post, the CAR, regimental forward command posts, and in a division general support role. Traditionally, division commanders have been forced to create forward command posts with communications equipment and vehicles from the division communication company. If the CG had two LAVC²s to act as his forward command post, he could command better from the front and additionally free up time the communications officer spends "jerry-rigging" commander C² vehicles to make better use of his time performing more

pertinent duties. After Desert Storm, Second Marine Division recommended a two vehicle $LAVC^2$ command section be added by T/O and T/E to the division.(3)

Another benefit of adding a $LAVC^2$ section to the division is the vehicles internal communications equipment comes fully installed and the division communication company is not responsible for fitting the $LAVC^2$'s communications gear out of hide. The company will be able to better employ its limited MRC-110s for purposes other than the CG's forward command post. After-action reports from South West Asia (SWA) have called for an additional 10 MRC-110s in the division communication company. (5) If the $LAVC^2$ is added, the number of requested MRC-110s could be reduced.

If the division were to fight a war today, the current forward C^2 assets would be difficult to manage. The commanding general would have to decide if he would take two $LAVC^2$s from LAR Battalion for his forward command post. If two C^2s were taken, LAR Battalion would be operating at less than full capacity. If the CG elects not to attach vehicles from LAR Battalion, the division main command post would be forced to create a forward command post "out of hide," balancing rear and forward LAR assets. Neither situation is desirable. Forward command posts were established in $LAVC^2$s during Desert Storm because reserve 4th LAI Battalion vehicles were available.

Infantry battalions would go to great lengths to get their hands on a $LAVC^2$ section. $LAVC^2$ would increase the effectiveness of the battalion in any environment. If an infantry battalion is given $LAVC^2$s, would commanders become focused on terrain that accommodates vehicle mobility vice their mission? This argument sounds just but is slightly flawed. With or without $LAVC^2$s, battalions are going to use some kind "jerry-rigged" C^2 vehicle. If terrain does not allow the command group to proceed in the desired direction the group simply dismount from their vehicles and continue by foot. $LAVC^2$s will not change this procedure.

$LAVC^2$ ALTERNATIVES

One alternative to purchasing additional $LAVC^2$s is the procurement and introduction of a new vehicle. Second Marine Division has submitted a Fleet Operational Needs Statement (FONS), October 92, identifying the need for a mobile command and control vehicle. Part of the division's justification for the FONS submission is the historic construction of mobile C2 vehicles and the lack of $LAVC^2$s or AAVC7A1s within the division. Second Marine Division also states the $LAVC^2$ would fulfill the requirement if it was fielded in sufficient numbers. The "AN/MRC-C^2s" would be employed using a shelterized HMMWV containing one UHF, one HF, eight VHF, one PLRS (Position Location Reporting System) and one GPS (Global Positioning System). As discussed in the FONS, the MRC-C^2 would make a great hub for battalion level and higher communications, but the $LAVC^2$

is still the best platform for a forward command post. The biggest drawback of developing a new vehicle is the lengthy lead time required to complete the research, development, final procurement and fielding.

THE PROPOSALS

Ultimately, we need to give our commanders a standardized C^2 platform from which to conduct operations whether it be a LAVC^2, MRC-C^2 or AAVC7A1. Three proposals, illustrated on the following three pages, have been identified by the authors to solve the non-standardized forward command post problem. The proposals are listed in tables 1, 2, & 3 and are broken down by unit and numbers of command and control vehicles. In figures 1, 2, & 3 total vehicle numbers are shown.

THE MECHANICS

One of the potential pitfalls of all three proposals is the long term cost of maintaining the vehicles. A possible option for saving on maintenance and support costs would be consolidating LAVC^2 maintenance into a single unit. LAVC^{2}s could be held within one unit to consolidate repair parts, tools, publications, mechanics, technicians, and petroleum, oil and lubrication. Within this unit, the vehicles could be tied to the specific command they support. Many general support units have converted to the consolidated maintenance system producing substantial savings in 1st, 2nd and limited 3rd echelon

PROPOSAL ONE- LAVC^2 command sections of two vehicles would be established at the MEF, division and regimental CEs within the division. Six G/S LAVC^{2}s would be maintained to support the division. Vehicles will be held and all maintenance conducted at one unit, either LAR or the CAR. Initial vehicle cost \$9.5 million.**

COMMAND AND CONTROL PLATFORMS

PROPOSAL ONE

UNIT	CURRENT LAVC^2	FORWARD C^3 REQUIREMENT	PROPOSED LAVC^2	AAVC7A1 DISTRIB
MEF CE	0	YES	2	0
MEU CE	0	YES	0	0
DIV. CE (LAVC^2)	0	YES	2	0
DIV. G/S (AAVC7A1)	0	YES	0	9
DIVISION G/S (LAVC^2)	0	YES	6	0
LAR Battalion	8	YES	8	0
TANK BATTALION	0	YES	0	2
REGIMENTAL CE	0	YES	4	0
INFANTRY BNs (6)	0	YES	0	0
CAR REGT CE**	0	YES	4	0
LAI BNs (2) **	0	YES	16	0
ARTY REGT CE	0	YES	2	0
ARTY BATTALION CE (3)	0	YES	0	0
AAV BATTALION	0	YES	0	4
TOTAL	8		44 **	15

** Assumes Combined Arms Regiment has receipted for its organic LAVC^2

Table-1

TOTAL: 16 NEW LAVC^{2}s

Advantage: Task Organized G/S LAVC2s to the GCE

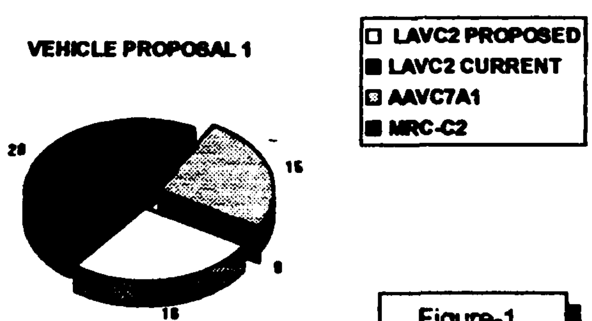


Figure-1

PROPOSAL TWO- LAVC^2 command sections of two vehicles would be established at the MEF CE, MEU CEs, Division CE, Regimental CEs. A one vehicle section would be established at the battalion levels. First and second echelons of maintenance would be a unit responsibility. Estimated initial cost is $16.01 million.**

COMMAND AND CONTROL PLATFORMS

PROPOSAL TWO

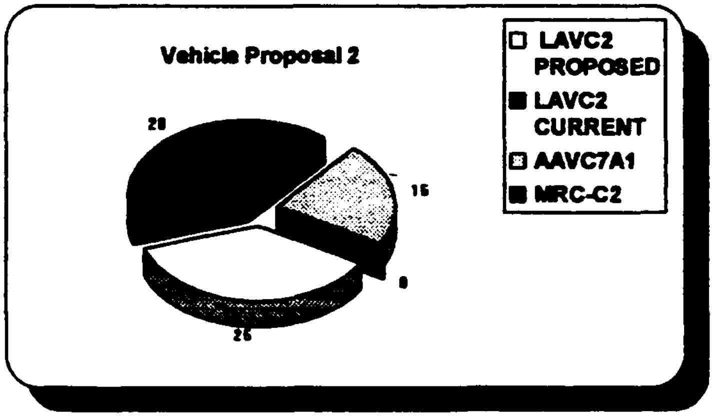
UNIT	CURRENT LAVC^2	FORWARD C^2 REQUIREMENT	PROPOSED LAVC^2	AAVC7A1 DISTRIB
MEF CE	0	YES	2	0
MEU CE	0	YES	6	0
DIV. CE (LAVC^2)	0	YES	2	0
DIV. G/S (AAVC7A1)	0	YES	0	9
DIVISION G/S (LAVC^2)	0	YES	0	0
LAR Battalion	8	YES	8	0
TANK BATTALION	0	YES	0	2
REGIMENTAL CE	0	YES	4	0
INFANTRY BNs (6)	0	YES	6	0
CAR REGT CE**	0	YES	4	0
LAI BNs (2) **	0	YES	16	0
ARTY REGT CE	0	YES	2	0
ARTY BATTALION CE (3)	0	YES	3	0
AAV BATTALION	0	YES	0	4
TOTAL	8		53**	15

**Assumes Combined Arms Regiment has receipted for its organic.

Table-2

TOTAL: 25 NEW LAVC^{2}s

Advantage: Organic LAVC^{2}s to the GCE



PROPOSAL THREE: LAVC^2 command sections of two vehicles would be established at the MEF and division CEs. Eight G/S LAVC^{2}s would be maintained by the LAR Battalion or CAR to support the division. Twelve new MRC-C^2 would be developed and employed by the regiments and battalions. LAVC^{2}s will be held and all maintenance conducted at LAR Battalion or the CAR. Initial cost of the LAVC^{2}s: $7.1 million per MEF.* This figure does not include cost of research, development, and production of the MRC-C2.**

COMMAND AND CONTROL PLATFORMS

PROPOSAL THREE

UNIT	CURRENT LAVC^2	FORWARD C^2 REQUIREMENT	PROPOSED LAVC^2	AAVC7A1 DISTRIB	MRC-C^2 **
MEF CE	0	YES	2	0	0
MEU CE	0	YES	0	0	0
DIV. CE (LAVC^2)	0	YES	2	0	0
DIV. CE (AAVC7A1)	0	YES	0	9	0
DIVISION G/S	0	YES	8	0	0
LAR	8	YES	8	0	0
TANK BATTALION	0	YES	0	2	0
REGIMENTAL CE	0	YES	0	0	2
INFANTRY BNs (6)	0	YES	0	0	6
CAR REGT CEs *	0	YES	4	0	0
LAI BNs (2)*	0	YES	16	0	0
ARTY REGT CE	0	YES	0	0	1
ARTY BATTALION CE (3)	0	YES	0	0	3
AAV BATTALION	0	YES	0	4	0
TOTAL	8		40 *	15	12

* Assumes Combined Arms Regiment has receipted for its organic LAVC^{2}s.
** MRC-C^2 has an undetermined cost and production time line.

Table-3

TOTAL: 12 NEW LAVC^{2}s

TOTAL: 12 NEW MRC-C^{2}s

Advantage: Organic LAVC^{2}s & MRC-C^2 to the GCE.

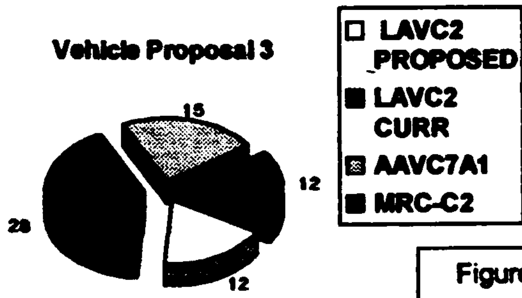


Figure - 3

maintenance costs. Teams are maintained and trained by the parent unit but are employed in support of the MEF. Proficiency and unit cohesion is increased by associating the same team with the same unit. Consolidation could be established at LAR Battalion then in the CAR when it becomes operational.

In addition to the cost of maintaining the vehicles a personnel cost is also associated with any additional system added to our inventory. Each vehicle requires a driver and vehicle commander, and for every three vehicles, an additional mechanic and radio technician is needed. We believe commanders would find the decision prudent to make requisite reductions from within their command to fill the $LAVC^2$ driver, technician, and vehicle commander positions. The $LAVC^2$ driver would come from the Motor Transport (MT) section or platoon of a unit, the technician from the communication platoon, and the vehicle commander from any section. When a unit deploys on a MEU with $LAVC^2$s, the attached LAV unit could conduct the maintenance. First, second, and limited third echelon maintenance would continue within the division. With all of the proposals comes an additional personnel maintenance requirement at third echelon (Maintenance Battalion, Force Service Support Group).

LAVC2 EQUIPMENT UPGRADES

LAVC2 Long range communications equipment used during Desert Storm proved to be inadequate and requires upgrades. The HF

radio in the vehicle needs to be replaced or a better amplifier added to accommodate longer range requirements. In addition to a better HF radio, a more efficient antenna capable of vertical or horizontal polarization is required. A rack mount modification for a AN/PSC-3 should be available for installation. This modification would include an omni-directional UHF satellite antenna similar to an aircraft fuselage dish antenna for satellite communications on the move. This type of antenna mount would prevent the unreliable procedure of aim and transmit on the move. Global positioning systems should be a standard piece of equipment with all LAVs. PLARS should also be a standard device with all LAVs. The Marine Corps should move toward an integrated friendly and enemy position and reporting system, incorporating GPS, PLRS, and possibly JSTARS (Joint Surveillance Target Attack Radar System).

The LAVC^2 is currently listed at $592,911 on 2nd LAI Battalion's Consolidated Memorandum Receipt. This amount was verified in an interview with the Supply Chief of 2nd LAI Battalion on 10 Jan 93. Given the Marine Corps budget in FY-93, the cost of the LAVC^2 is a small investment for a tremendously capable and necessary communications vehicle. In the Fiscal Year 1993 budget, the Marine Corps allocated $1.3 billion for 36 F/A-18 C/Ds, $110.3 million for their advance procurement, and $889.9 million for research and development for the F/A-18 E/F. Other Marine air purchases include EA-6B upgrades, AV-8B upgrades for outyear procurement, reserve F/A-18s, new CH-53s, AH-1Ws, and

the V-22 at the cost of $1.9 billion. Although these items are bought with blue dollars, numerous other projects that were funded, including the LAV AD (LAV Air Defense variant), armored combat excavator, Marine enhancement program, 155mm M864 ammunition, light weight 155mm howitzer, logistics vehicle system development, a C-20 aircraft, research and development for the LAV-105 totaling over $290 million. (7:4) ***For less than the cost of two F/A-18s, every battalion level command post and higher (excluding the CARs) could have a reliable and mobile C^2 platform. Money needs to be allocated for LAVC^{2}s.***

AUTHORS' CHOICE

The authors feel the best overall proposal and most economically feasible is **PROPOSAL ONE**. The MEF and division command elements would have identified LAVC^2 sections, while 6 LAVC^{2}s would be maintained in GS of the division. The 6 LAVC^{2}s, coupled with the current 15 AAVC7A1s, would give the division commander sufficient C^2 platforms and tremendous flexibility. The proposal we feel "Fleet Marines" would like most is **PROPOSAL TWO**. Every unit would have its own identified LAVC^2 or AAVC7A1. Proposal one is also the most expensive in cost, personnel and maintenance. **PROPOSAL THREE** has potential and the MRC-C^2 should be pursued as a standard C^2 platform for our future main command posts. Realistically, we need standardization now. The MRC-C^2 is just an idea but the LAVC^2 is reality. The Pentagon N-6 staff

stated, in an interview 22 February 93, "Most C^2 systems take 10-12 years from idea to production."

CRITICAL FACTORS AFFECTING AUTHORS' CHOICE

The $LAVC^2$ provides a standard platform upon which a commander can lead from the front. Fighting on today's advanced battlefields, commanders can no longer afford to project a large footprint or expose themselves to the enemy while moving forward with their forces into battle. Instead of numerous MRC vehicles moving out from the main CP, one or two $LAVC^2$s would be better suited. The $LAVC^2$ forward command post would be faster, and have a smaller footprint. The main CP would have more communications reliability since no additional equipment is taken "out of hide" to create the forward command post, and the forward command post would be more readily available for movement. Most importantly, the $LAVC^2$ significantly increases the survivability of the command attack when compared to MRC vehicles.

Without exception, commanders from all levels found the necessity for a standard forward command post, instead of "jerry-rigged" configurations to be valid and justified if we are to continually improve as a Corps. Will combat commanders fail to destroy the enemy and achieve their missions if they do not have $LAVC^2$s? No. Commanders will continue to find and invent ways to command from the front and win in combat. We will continue to "jerry-rig" command posts for our commanders. However, it is only

a matter of time before <u>we fail</u> to complete an assigned mission because of the lack of a standardized C^2 vehicle. We do a disservice to our commanders by not providing a standard vehicle for forward C^2. The standard vehicle is available today to provide a true combat multiplier for commanders--the **LAVC^2**.

BIBLIOGRAPHY

1. Antal, John F., "Forward Command: The Wehrmacht's Approach To Command and Control in World War II. "Armor Nov.-Dec.1991.

2. Von Mellenthin, Generalmajor A.D.F.W. conference notes from Armor Warfare in World War II, (Columbus, Ohio: Battelle Columbus Laboratories) May 10, 1979.

3. Holcomb, Ltc. K. "Operation Desert Shield Conducted by USCENTCOM," Marine Corps Lessons Learned (MCLLS: 22555-171000) March 21, 1991.

4. Mountcastle, Ltc. "Command and Control of Armor Units in Combat," Military Review Nov. 1985.

5. Petronzio, MAJ. "Operations Desert Shield Conducted by USCENTCOM," Marine Corps Lessons Learned (MCLLS: 31624-02300) March 16, 1991.

6. Moore, John R., "Communications and Maneuver Warfare," Marine Corps Gazette Mar. 1990.

7. "News," Marine Corps Gazette Nov. 1992.

APPENDIX 1

ACRONYMS

AAV	Assault Amphibian Vehicle
AAVC7A1	Amphibious Assault Vehicle Communications Variant
AN/MRC-C^2	Mobile Radio Communications Command & Control Variant
AN/PSC-3	Portable Satellite Communications -3
Battalion	Battalion
C^2	Command & control
CAR	Combined Arms Regiment
CE	Command Element
CG	Commanding General
COC	Combat Operations Center
CP	Command Post
CPX	Command Post Exercise
FMF	Fleet Marine force
FONS	Fleet Operational Needs Statement
FSSG	Force Service Support Group
G/S	General Support
G/S-2	General/Special Staff Intelligence Officer
G/S-3	General/Special Staff Operations Officer
GCE	Ground Combat Element
GPS	Global Positioning System
Gerry-rigged	System that is never standardized (hasty put-together)
HF	High Frequency
HMMWV	High Mobility Multi Wheel Vehicle
JSTARS	Joint Surveillance Target Attack Radar System
LAI	Light Armored Infantry
LAR	Light Armored Reconnaissance
LAV	Light Armored Vehicle
LAVC^2	Light Armored Vehicle Command & Control variant
MAGTF	Marine Air Ground Task Force
MCLLS	Marine Corps Lessons Learned
MEF	Marine Expeditionary Force
MEU	Marine Expeditionary Unit
MRC	Mobile Radio Communications
MRC-C^2	Mobile Radio Communications Command & Control variant

PLRS	Position Location Reporting System
POL	Petroleum Oil Lubricants
SWA	South West Asia
T/E	Table of Equipment
T/O	Table of Organization
USCENTCOM	United States Central Command

THE MARINE EXPEDITIONARY UNIT: CAN IT SUPPORT THE HUMANITARIAN MISSION?

Submitted to
Major M.K. Snyder
and Mrs. Sandra Kirkpatrick
at the Communications Officers School
Quantico, Virginia

Captain Andreas Bynum, USMC
Captain Eugene Dittler, USAF
Captain Darryl Pixler, USMC
Captain Ronald Zich, USMC

March 17, 1993

THE MARINE EXPEDITIONARY UNIT
CAN IT SUPPORT THE HUMANITARIAN MISSION?

Outline

Thesis: The Marine Expeditionary Unit (MEU), the Marine Corps forward deployed force, is not adequately staffed, trained or equipped to conduct humanitarian operations. With a relatively small investment, the MEU can become a viable force to successfully accomplish humanitarian missions.

I. Introduction

   A. The logical choice to take on the humanitarian mission
   B. Humanitarian intervention versus humanitarian assistance
   C. Recent operations mark the MEU as "force of choice"
   D. The MEU is limited by a lack of equipment

II. Identifying the Problem

   A. Past humanitarian missions: Some important lessons learned
      1. Operation Provide Comfort: Can we talk?
      2. Operation Sea Angel: Intelligence database needed, no experience necessary
      3. Operation Restore Hope: My kingdom for a computer!

III. Solving the Problem

   A. Upgrading MEU Computer and Intelligence Assets
      1. Trojan Spirit land based intelligence dissemination system
      2. JDISS: Sea based intelligence analysis platform
      3. Local Area Network: Data help for expanding operations
      4. Maps: Get with the program (CD/ROM)!
   B. Personnel: Upgrade to the FHAST concept
   C. Imagery and photo support: Develop the UAV

IV. The Solution in Action: Operation True Support

V. Conclusion

THE MARINE EXPEDITIONARY UNIT: CAN IT SUPPORT THE HUMANITARIAN MISSION?

INTRODUCTION

In the future, the American military will be called on to perform more and more humanitarian missions. The Marine Expeditionary Unit (MEU) appears to be the ideal force to accomplish this mission. The MEU is the immediate response, sea-based Marine component of the fleet commander's amphibious and power projection forces. MEUs are deployed continuously in the Mediterranean Sea and Pacific Ocean, and periodically in the Atlantic Ocean, Indian Ocean, and Caribbean Sea. This combination of global reach and quick response makes the MEU a logical choice to take on the role as an advance force to prepare for a larger, more permanent force, such as a Marine Expeditionary Force (MEF).

The term humanitarian mission can refer to either *humanitarian intervention* or *humanitarian assistance.* The Marine Corps will be called upon to perform both missions in the future. Intervention and assistance are subsets of the same mission. The difference lies in the amount of violence

a Marine unit will encounter when attempting to provide relief to beleaguered people. Bangladesh was a "pure" humanitarian assistance mission, while the operation in Somalia is classified as humanitarian intervention because of the ongoing clan warfare.

Recent operations such as *Provide Comfort*, *Sea Angel*, and *Restore Hope* highlight the ability of the MEU to fulfill a variety of humanitarian missions in a flexible manner. However, these operations also bring to light problems which would likely limit the MEU's success in future operations. All of these problems are related to the idea that the MEU will be utilized more frequently as America's armed forces are restructured. As a result, the MEU's equipment and training must be commensurate with assigned missions.

When conducting humanitarian operations, the MEU suffers from a lack of communications equipment; insufficient maps to aid in mission planning and execution; scanty information on all aspects of indigenous populations (for example, living conditions, population density, attitudes toward American intervention); and a lack of information on infrastructure. Only by acknowledging the increasing role of the MEU as the nation's "force of choice"

and equipping it to perform in this capacity can we expect the MEU to be successful in future humanitarian missions.

IDENTIFYING THE PROBLEM

PAST HUMANITARIAN MISSIONS: SOME IMPORTANT LESSONS LEARNED

If the MEU is to successfully tackle humanitarian missions, the Marine Corps must first perform a critical analysis of past operations. Past events are the perfect teachers for the future. If the Marine Corps does not learn from past humanitarian missions, it is destined to repeat the same errors. During the past two years, the Marine Corps has undertaken a variety of missions to assist nations beleaguered by natural disaster, armed conflict, or both. Each mission was unique; each involved distinct political concerns and lacked critical support in the command, control, communications, computers, intelligence, and interoperability (C4I) arena. Three major operations will be reviewed and examined for C4I strengths and weaknesses.

Operation *Provide Comfort*: Can we talk?

On 9 April 1991, the 24th MEU was directed by the Joint Chiefs of Staff to support Operation *Provide Comfort*. This operation provided humanitarian support to Kurdish refugees in northern Iraq. *Provide Comfort* was unique in that the MEU was required to operate several hundred miles inland and therefore received limited naval support from the attached Mediterranean Amphibious Readiness Group (MARG). On 14 April, the 24th MEU was made part of a joint task force. The primary mission of the MEU was to provide security and establish temporary living quarters for the Kurdish refugees.

Although the MEU was able to handle its assigned mission effectively, problems arose in communications, mapping support, and interfacing with civilian relief organizations. Because an enormous amount of attention was focused on the plight of the Kurdish refugees, numerous civilian organizations responded with large teams of workers and equipment to transport supplies. The MEU was tasked to provide security, logistics, and aviation support to all the civilian relief organizations working inside the Marine

operating area. (15) Although the Marines maintained good working relationships with each of the civilian organizations, the already thinly stretched resources of the MEU were stretched even further as more relief agencies entered the area. (8) The after action report stated that the ability of the MEU to effectively deal with civilian agencies can be enhanced by providing a civil affairs team and increasing the amount of communications equipment. (15) The increase in communications equipment would directly enhance the working relationship between the MEU and the civilian relief organizations.

The shortage of communications equipment in the MEU is well documented. The 24th MEU, during Operation *Provide Comfort,* was required to maintain communications with the Joint Task Force and the commander of naval forces. (8) During the operation, the MEU found itself chronically short of all types of radio assets, especially satellite radios. A MEU currently deploys with six Army-Navy/Portable Satellite Communications (AN/PSC-3A) radios, but during the operation as many as 15 AN/PSC-3As were in use at any given time. (8) The deployment of all four MEU elements (ground, aviation, service support, and command), the extensive use

of reconnaissance teams, and the relatively low priority of satellite channel assignments for a MEU degraded the reliability of communications. To further complicate the MEU communications problem, the assignment of wideband satellite channels resulted in overcrowded nets and subjected users to "bleed-over" from other channels. (11)

The MEU's ability to establish a telephone or communications center is also very limited. In the case of Operation *Provide Comfort*, the MEU was dependent on outside agencies to provide the necessary communications support. (11) Although this support was provided, the process was not without problems. The MEU attempted to use the Air Force communications center for the transmission of maintenance data, but because of the incompatibility of the software, the MEU was forced to send all maintenance transactions to Camp Pendelton via courier. (12)

The need for maps was never-ending; maps of the operating area were in chronic short supply. The initial delivery of maps to the MEU occurred only 36- hours before the first units flew across the border. (17) The need for accurate maps is crucial, for without maps, it is nearly impossible for a commander to properly prepare and direct

his forces. However, the MEU has a limitation that cannot be overlooked -- storage space. The MEU has a finite amount of space allocated for storage of supplies. The MEU must balance the right amount of *beans, bullets, band aids, and map pallets*. Fleet Marine Force Atlantic (FMFLANT) commented on this lesson learned from the MEU:

> *To provide the MEU with coverage of every possible area of employment may be fiscally and physically infeasible. (17:2)*

Our solution to FMFLANTs concern is discussed in a later section.

Operation *Sea Angel:* Intelligence database needed, no experience necessary!

Although this operation was conducted by a Marine Expeditionary Brigade (MEB), there are many similarities to Operation *Provide Comfort*. Again, there was a constant lack of maps to support the scheme of operations. Lieutenant General Stackpole, Commanding General, III Marine Expeditionary Force, writes:

> *[Because of the lack]... of maps or geographical information on Bangladesh, we had to operate almost totally in the dark. This is something we must correct. (19:112)*

In a country where storms constantly change the coastline, the need for accurate maps is essential. The humanitarian assistance effort was also hampered by a Bangladesh government that was still in its infancy and was unable to provide up-to-date maps.

Unlike the operation in northern Iraq that received an abundance of intelligence from Operation *Desert Storm*, Bangladesh was not high on the JCS list of potential trouble spots. Therefore, Operation *Sea Angel* was accorded a low priority for intelligence gathering assets. (21) Lieutenant General Stackpole commented:

> *...[the] lack of real-time intelligence was such that they [the MEB] really didn't know what we were standing into. [sic] (19:112)*

In humanitarian assistance operations, such as the one in Bangladesh, it is essential that the proper type of intelligence data reach the supported command. Examples of humanitarian intelligence data required are the religious taboos of a nation, congregation points for survivors, known water sources, and potentially hostile groups.

Operation *Restore Hope*: My kingdom for a computer!

If the current mission in Somalia has taught us anything, it is that we have yet to learn from previous humanitarian assistance operations. Mr. Robert Steele, C4I Analyst Headquarters Marine Corps (HQMC), argues that very little has been learned from past humanitarian missions:

> *If anything, Somalia has confirmed everything we learned in Bangladesh. The Marine Corps is not trained, equipped, or organized to conduct sustained humanitarian assistance missions in low intensity conflict environments: national and defense intelligence organizations are not trained, equipped, or organized to provide a full range of intelligence and information services necessary to conduct humanitarian assistance missions in low intensity conflict environments.... It's a whole new ball game, and the Marine Corps force structure group did not understand when it crafted the Corps of the future using precepts of the past. (21)*

Mr. Steele portrays a rather gloomy scenario when the Marine Corps is assigned to humanitarian assistance missions. After returning from Somalia, the Marine Air Ground Task Force (MAGTF) Instructional Team (MIT) was able to partially substantiate Mr. Steele's views and provide some insight into the problems the MEU experienced. Information from naval vessels supporting the MEU had to be transmitted via courier. (9) There was no electronic means of transmitting

intelligence data to the land-based MEU intelligence and operations staff. (9) In addition, the MEU was inundated with imagery support from national level intelligence agencies, but there was no means of transmitting this data to the tactical level. (9) The MEU lacked the data transmission system vital for the rapid dissemination of data during periods of increased operations tempo. Reliable printers capable of producing "photo quality" maps or imagery were also not available. (9)

As can be seen, all three operations exhibit a disturbing trend: lack of adequate maps, lack of sufficient communications and data transmission equipment, and a lack of usable intelligence. Even operations that are not categorized as *humanitarian* have experienced the same problems. Operation *Sharp Edge*, involving the rescue of noncombatants from Liberia, experienced the same difficulties in timely receipt of intelligence data and a lack of tactical maps. (10:1) The following sections will address these deficiencies and provide solutions that fit within the current Marine Corps budget.

SOLVING THE PROBLEM

UPGRADING MEU COMPUTER AND INTELLIGENCE ASSETS

Providing the MEU with more communications equipment, additional computers, and an intelligence analysis capability will help to accomplish the mission and improve the transition period if a larger force relieves the MEU. The systems we propose adding include: Trojan Spirit, Joint Deployable Intelligence Support System (JDISS), Local Area Network (LAN), and Compact Disc/Read Only Memory (CD/ROM) map support from the Defense Mapping Agency (DMA).

Trojan Spirit: Land-based intelligence dissemination system

Trojan Spirit would provide the MEU with a communication path into the Intelligence Analysis System (IAS) in situations where it is necessary for the command element to go ashore. The Marine Corps intends to buy six Special Purpose Integrated Remote Internal Terminal (SPIRIT) II systems and up to 55 ultra high frequency (UHF) satellite

communications (satcom) suitcase versions, which are currently being developed. (2) When the MEU arrives ashore and puts the system on line, the MEU will have a dedicated intelligence link into DSNET 1, DSNET 3 (e.g., DoDIIS access), and DSSCS networks, as well as the Central Intelligence Agency, National Security Agency, and Defense Intelligence Agency databases. Unfortunately, the problem of disseminating intelligence is often larger than the problem of collecting intelligence. In the past, courier (helicopter or surface ship) and facsimiles have been the main means of dissemination. This slow method of transfer is unacceptable. If the MEU had four of the SPIRIT II suitcase versions, it could initially distribute this equipment to the ground, air, command, and service support elements. These four elements will form the nucleus of a system for follow-on forces.

In Operation *Sea Angel*, a small MEB detachment worked out of the American Embassy in Bangladesh, initially coordinating the relief effort. (5) This detachment relied upon voice and limited message traffic for information. Fortunately the need did not arise for maps and imagery; if it had, the detachment was incapable of

receiving this information until supported by an Air Force Communications Group. (5) Trojan Spirit was originally developed as a training system for Army signal intelligence operators. It has, however, evolved into a system capable of supporting real world contingencies. This satellite communication system is able to translate between non-interoperable communications protocols and pathways. Configured in two High Mobility Multi-Wheeled Vehicles (HMMWV), Figure 1 lists the important characteristics of this system.

- ✓ 14 channels digital voice, data, or FAX.
- ✓ 10 SI/TK channels.
- ✓ 1 DSNET 3 router.
- ✓ 4 Secret collateral channels.
- ✓ ETHERNET LAN capability
- ✓ Satellite auto-tracking capability.
- ✓ Secondary imagery capability.
- ✓ Intelligence dissemination capability.

Figure 1: Characteristics of Trojan Spirit (2)

Joint Deployable Intelligence Support System (JDISS): Sea-based intelligence analysis platform

The JDISS provides the MEU with entry into the IAS while shipboard. (1) Currently, the MEUs are relying on the Navy to install JDISS terminals and provide the communication path. The JDISS is flexible enough to go over most transmission paths, but it must have a Super High Frequency (SHF) satellite communications link to maximize its capabilities. The Navy is currently installing Quicksat systems on all command and control vessels allowing the use of JDISS while afloat. (1) The JDISS is composed of a file server and three workstations. Figure 2 lists the important characteristics of a JDISS.

- ✓ 5.2 Gigabyte capacity
- ✓ CD/ROM capability
- ✓ Ports for two tape punches
- ✓ Ports for standard laser printer and plotter
- ✓ 9.6 Kbps data transfer rate
- ✓ SHF transmission capable

Figure 2: Characteristics of JDISS (1)

The JDISS can exchange information with deployed Trojan Spirit II teams through access into national and theater level intelligence fusion centers.

Local Area Network (LAN): Data help for expanding operations

To improve information flow within the MEU, a LAN capability is required. In the near future, amphibious ships are going to have internal LANs with varying degrees of access into Wide Area Networks (WAN). While the Marines are embarked, they will have access to these LANs and WANs. However, as soon as the MEU has landed, the connection to these vital systems will be cut off because the MEU does not possess the equipment required to transfer data. In cases where it is likely that a larger force will replace the MEU, a LAN established ashore would provide a smoother transition. The standard end user computer equipment (EUCE) and communications equipment necessary for data transfer and networking must be deployed with the MEU for LAN and WAN access.

Maps: Get with the program (CD/ROM)!

Currently each MEU deploys with approximately 60 pallets of maps for contingency operations. (4) Even with

all these pallets, the MEU still does not have all the maps it needs. The Defense Mapping Agency (DMA) can put its most up-to-date maps of the world on CD/ROM. (6) Having accurate maps of the operations area is an important prerequisite to successful completion of the mission. The current method of deploying with all of these map pallets is an enormous waste of storage space onboard ship. By having maps on CD/ROM, the commander and staff will have access to map data that will allow the initial planning of the operation. The consensus in all the cases studied was that the DMA was able to produce maps in sufficient quantities and deliver them in a timely manner so that all mission requirements were satisfied.

PERSONNEL AND TRAINING: UPGRADING TO THE FHAST CONCEPT

The MEUs organic intelligence collection assets are designed for information collection close to the objective area and are not designed to collect information for humanitarian missions. To properly prepare for a humanitarian operations, the MEU requires extensive

information. National and theater level assets will compliment detailed information gathered by the MEU.

From a personnel and training standpoint, information concerning such areas as potable water, bridge capacities, road conditions, and health matters can be obtained by the MEU. Tasked organized units from within the MEU are required to gather such information. An example of such a detachment is an infantry squad providing security for an engineer platoon surveying a road or bridge. Force Reconnaissance Marines, Sea Air Land (SEAL) teams, and the MEU Service Support Group (MSSG) are available to the MEU commander for these missions. The MEU must train for humanitarian missions just as it would for any other mission. Lieutenant General Stackpole, Operation *Sea Angel* commander, wrote:

> *Planning and executing deployments in relief efforts are, in many respects, similar to planning and executing the movement phase of wartime contingencies. (20:18)*

For an actual operation, current infantry training in urban terrain, noncombatant evacuations, and offensive operations is sufficient for humanitarian missions. However, Force Reconnaissance, SEALs, and MSSG must train and be evaluated on humanitarian mission information gathering as part of the

MEU (Special Operations Capable (SOC)) program. Even with MEU assets and input from theater and national level assets, the MEU will not receive all the necessary information to adequately perform a humanitarian mission.

In most humanitarian operations, the MEU will be the lead element of a larger follow-on force. The follow-on force can be expected to arrive as soon as 48 hours after the initial landing by the MEU, depending on the operation. The first echelon of this force must be a task organized element, designed specifically to enhance the commander's ability to evaluate the situation and to provide the commander with recommendations for subsequent operations. Not every humanitarian operation will require combat troops, as in Somalia, since some operations will be in permissive environments. Figure 3 illustrates a notional Fleet Humanitarian Assistance and Support Team (FHAST).

Civil Affairs/PAO
0107 - Civil Affairs Officer
4302 - Public Affairs Officer
4313 - Broadcast Journalist
4321 - Print Journalist
4391 - Public Affairs Chief

Engineers
1120 - Utilities Officer
1302 - Engineer Officer
1142 - Electrician
1169 - Utilities Chief
1316 - Metal Worker
1361 - Engineer Assistant

Supply
3002 - Ground Supply Officer
3043 - Supply Admin and Operations Clerk
3044 - Purchasing and Contracting Specialist
3051 - Warehouse Clerk

Logistics
0481 - Landing Support Specialist
0491 - CSS Chief

Transportation
5803 - Military Police Officer
5811 - Military Police

Figure 3: Notional FHAST

This force would be designed specifically for gathering information and reporting directly to the MEU commander and

his staff with observations and recommendations. The FHAST would require specialized training, and once trained, this force could deploy to any location as directed. HQMC or Quantico Marines could provide the necessary staff. This force is similar in concept to the MIT currently at Quantico. However, unlike the MIT, who became additional staff members of I MEF during Operation *Restore Hope*, (9) these personnel are initially for observation and recommendation only, not augmentation. Once relief operations begin, the FHAST can be incorporated into the MEU staff.

The key to a successful humanitarian mission is gathering logistics requirements and fulfilling them. Captain Daniel J. Choike and First Lieutenant William J. Bowers, who participated in disaster relief operations for Hurricane Iniki, wrote:

> *...essential elements of information (EEIs) must still be answered before responding to an assignment [disaster relief]. EEIs developed by the operations section for recon and survey teams later helped the reaction process. (3:29)*

Commander-in-Chief (CINC) Atlantic has published a Generic Intelligence Requirements Handbook (GIRH) which covers the basic intelligence requirements for certain types of

operations, but it does not include humanitarian missions. By creating specific EEIs for humanitarian missions, a user-friendly GIRH would be established for the MEU. This task should be assigned to the Marine Corps All Source Fusion Center to provide all MEUs the same initial requirements.

IMAGERY AND PHOTO SUPPORT: DEVELOPING THE MARINE UAV

Major Werner, Intelligence Officer (S-2) 24th MEU, brings to light another information gathering problem. "The MEU," he stated, "is lacking in any type of photo and imagery capability." (22) This problem has led the Marine Corps to rely strictly on Navy assets for imagery and photos. Although the Fleet Imagery Support Terminal System (FIST) and JDISS are reliable systems, they rely on national and theater level assets for imagery and photos. The MEU requires its own organic imagery and photo capability, which can operate either afloat or ashore. The answer to this problem is the vertical takeoff and landing (VTOL) unmanned aerial vehicle (UAV). In developing a UAV, the Marine Corps

has identified a number of functions which its UAV must be capable of performing. Figure 4 lists these functions.

- ✓ Command and control
- ✓ Data relay
- ✓ Laser designation
- ✓ Signals intelligence
- ✓ Electronic combat
- ✓ Search and rescue
- ✓ Mine countermeasures
- ✓ Meteorology
- ✓ Special operations

Figure 4: Required UAV functions (7:855)

These functions will enhance the MEU's ability to operate independently. The Joint Project Office of the Department of Defense and a number of civilian contractors are working towards such a vehicle.

Although there are a great many benefits to such a vehicle, there are drawbacks as well. In addition to the UAV itself, sensors and other payloads, a mission planning system, ground control stations, data terminals, remote video terminals, ground support equipment, and a launch and recovery system are required for operation. (7:854) All these systems are expensive; in fact, the vehicle is one of the least expensive components. Associated costs include training, maintenance, and personnel increases.

Additionally, the space required to store all this equipment may not be available to the MEU, depending on the ship configuration provided by the Navy. While afloat, other concerns are raised with the use of the UAV. Takeoff and landing areas, communications requirements, and electrical problems are some of the problems that must be dealt with prior to effective employment of the UAV.

Deploying the VTOL UAV with a MEU will offer the MEU the imagery and photo capability it needs as well as forward basing this asset for follow-on units. The VTOL UAV will offer the commander of follow-on forces a greater ability to gather critical information for mission planning. The Marine Corps must consider purchasing the VTOL UAV for the MEU, as the benefits greatly outweigh the drawbacks.

THE SOLUTION IN ACTION: OPERATION TRUE SUPPORT

Operation True Support is an imaginary operation to show how our concepts would be used in an actual humanitarian operation.

The MEU commander (CO), reading the daily message traffic, notices that a major earthquake has occurred in the country of Virginia. He tasks his intelligence officer (S-2) to gather information concerning Virginia and brief him in 24 hours. The MEU, afloat on the USS Support, is currently located 500 miles from the coast of Virginia. The S-2 gathers information and prepares the brief. Using JDISS, the S-2 provides information on the population, infrastructure, and political situation of Virginia. Using FIST, high resolution imagery of the affected area is also provided. Shortly after the S-2 delivers the brief, the CO is informed that the MEU has been tasked to provide humanitarian assistance to the capital city of Virginia, located 100 miles inland. The CO asks the S-2, "What other information do I need to accomplish this mission?"

The S-2, realizing the need for greater detail, coordinates with the operations officer (S-3). Together, they use the GIRH produced by the Marine Corps to find specific information needed for the operation. Realizing that information will be available from numerous sources, they begin tasking subordinate units. The S-2 again accesses FIST and JDISS to receive information from national

and theater assets. The MEU S-3 requests that the FHAST be deployed to Virginia and begins operational planning based on the CD/ROM computer maps. The MEU S-3 undertakes task organizing MEU assets based on the mission requirements. Unit commanders start refresher training for humanitarian missions.

After reaching Virginia, the MEU staff goes ashore to the American Embassy to coordinate the relief effort. Upon arrival, the staff finds the embassy in worse than condition than expected. Additionally, numerous civilian relief agencies are already in place and have requested military assistance. The MEU determines additional requirements by using Force Reconnaissance, SEALS, and the MSSG platoon. The FHAST begins gathering information for the commander. National and theater level data is available through the Trojan Spirit system. The VTOL UAV is used to gather photographs of areas not accessible to land vehicles and other vital areas which cannot be readily covered by organic air assets.

The MEU, having received enough information to begin full scale operations, starts the deliberate planning process. Information flowing into the theater from outside

sources travels via AN/PSC-3A or Trojan Spirit. The LAN is used extensively for communications within the operations area. Once a follow-on force arrives, it will establish a larger communications footprint, using the MEU Trojan Spirit system and LAN as its base.

CONCLUSION

Only with the listed improvements in MEU support will there be a unit properly prepared for tackling the humanitarian mission. Lieutenant General H.C. Stackpole and Colonel Eric Chase provide an outstanding summary to the dilemma faced by units when initially given the warning order to deploy.

> *True readiness can only exist when a force has anticipated a mission and then planned, trained, and prepared for its execution. In the case of humanitarian missions, lives depend on rapid response; timing is critical; preparation is key. These essential preparations must be thorough, and they must be accomplished without detracting from the organizations overall readiness to carry out its primary military functions. (20:20)*

In the emerging new world order, the difference between humanitarian assistance and humanitarian intervention will be blurred. The Marine Corps must have troops trained and prepared to respond to a ***humanitarian mission,*** regardless of the presence of hostilities: Marines must be ready to help those who cannot help themselves. The Marine Corps has men and women willing to help; let's be sure they receive proper equipment, training, and support.

BIBLIOGRAPHY

1. Bayes, SSgt, USMC. Personal interview, Camp Lejeune. 11 January 1993.

2. Bradunas, Maj., USMC. Personal interview, MCCDC, MARCORSYSCOM. 11 January 1993.

3. Choike, Daniel J., Capt., and Bowers, William J., 1stLT, USMC. Special Purpose Task Force Deploys to Kauai: Marine Corps Gazette, Feb. 1993.

4. Duffy, Brian, Capt., USMC. Personal interview, 1st FSSG. 14 February 1993.

5. Houston, Col., USMC. Personal interview, MCCDC. 20 January 1993.

6. Inge, Jane A. Federal Agencies Taking Advantage of CD-ROM. Computer Digest, Oct 1991 :13

7. Jane's Defence Weekly. Matching Systems to Missions. 16 May 1992. 854-855.

8. Kohl, LtCol., Commanding Officer MSSG 24th MEU. Personal Interview, MCCDC. 03 March 1993.

9. MAGTF Instructional Team. Personal interview, MCCDC. 21 January 1993.

10. MCCLS number 82432-47442. Title: Intelligence Gathering and Analysis Prior to and During MARG 2-90 Insertion (Operation SHARP EDGE).

11. MCLLS number 80307-72862. Title: Telephone and Communications Center Capability (Operation PROVIDE COMFORT).

12. MCLLS number 80338-43138. Title: Ashore Mobile Contingency Communications (AMCC) (Operation PROVIDE COMFORT).

13. MCLLS number 80307-24434. Title: UHF Satellite Radios and Antennas (Operation PROVIDE COMFORT).

14. MCLLS number 80345-06785. Title: Humanitarian Relief Supplies (Operation PROVIDE COMFORT).

15. MCLLS number 80282-89954. Title: Command Relations with Relief Agencies, Local Authorities and Allied Forces (Operation PROVIDE COMFORT).

16. MCLLS number 80273-70501. Title: Chronology of Events (Operation PROVIDE COMFORT).

17. MCLLS number 80278-17430. Title: MAP Support (Operation PROVIDE COMFORT).

18. MCLLS number 61050-54776. Title: MC&G Support for Operation SEA ANGEL.

19. Stackpole, Harry C., LtGen, USMC. Angels From The Sea. Proceedings, May 1992.

20. Stackpole, Harry C., LtGen, USMC, and Chase, Eric L., Col., USMC. Humanitarian Intervention and Disaster Relief: Projecting Military Strength Abroad to Save Lives: Marine Corps Gazette, Feb. 1993.

21. Steele, Robert, C4I Analyst HQMC. Personal Interview, HQMC. 24 November 1992 and 04 January 1993.

22. Werner, Maj., USMC. Personal interview, Camp Lejeune. 11 January 1993.

WANTED: C4I WARRIORS
THE REQUIREMENT FOR MARINE CORPS C2 SYSTEMS PLANNERS

Submitted to
Major Febuary
and
Ms. Lloyd-Stanger
at the Communication Officers School
Quantico, Virginia

Captain Jeffrey P. Davis, USMC
Captain David G. Gran, USMC
Captain Timothy J. Hall, USMC

7 April 1993

THE REQUIREMENT FOR MARINE CORPS C2 SYSTEMS PLANNERS

OUTLINE

Thesis: To meet the evolving requirements of modern warfare, the Marine Corps must maintain a cadre of C2 Systems Planners to operate command and control systems. To attain this goal, the Marine Corps must integrate C2 Systems personnel into one Data Communications MOS and implement a comprehensive C2 Systems Planner specific training program.

I. The Modern Battlefield

II. Background

- A. Meaningful integration of C2 systems and personnel requires a basic understanding of the C4I concept.
- B. A technology explosion has caused a reliance on computers to manage C2 systems.
- C. Success in the C2 arena requires effective integration of C2 systems and personnel.

III. Future Marine C2

- A. Reliance will be placed upon MTACCS (Marine Tactical Command and Control System) to manage future MAGTF C2 systems.
- B. Systems integration is required within the MTACCS concept.

IV. Proposed Solution

- A. Creation of the Data Communications Officer can be accomplished in three phases.
  1. Redesignation of 2502 and 4002 as Data Communication Officers
  2. Consolidation of 2502 and 4002 MOS Fields
  3. Information System Training for Current 4002 Company Grade Officers
- B. The newly created Data Communications MOS offers advantages as well as disadvantages.
- C. Establishment of the C4I Systems Planner Additional MOS (AMOS) will improve C2 systems integration within the Marine Corps.

V. Conclusion

Appendix 1 - Proposed Data Communications Officer Course Curriculum

THE REQUIREMENT FOR C2 SYSTEMS PLANNERS

THE MODERN BATTLEFIELD

Success on the modern battlefield depends greatly upon the responsiveness of various command and control (C2) systems and their timely interpretation, presentation, and dissemination of critical information to the operational commander. The importance of this issue is magnified by the fact that the Marine Corps continues to develop and field a significant number of C2 systems which intersect all battlefield functional areas. This rapid increase of state-of-the-art information systems not only demonstrates the complexities which technology brings to the battlefield, but also validates the requirement within the Marine Corps for capable C2 systems planning personnel.

Future Marine Corps C2 systems will be required to receive information from and provide information to a myriad of joint and combined agencies while conducting operations. Without proper planning and employment of C2 systems, the operational commander will be quickly overloaded by rapidly evolving C2 systems technology. Currently, the Marine Corps does not properly train or utilize communications and data systems officers to employ multiple C2 systems in the joint and combined arena.

Today, with the advent of Tri-Service Tactical (TRI TAC) systems and other new capabilities, the Data Communications Officer must be conversant at all levels of communications and with other service capabilities. To meet the evolving requirements of modern warfare, the Marine Corps must maintain a cadre of C2 systems planners to operate command and control systems. To attain this goal, the Marine Corps must integrate C2 systems personnel into one data communications MOS and implement a comprehensive C2 systems-planner-specific training program.

In short, the integration of communication and data systems within the Marine Corps has already taken place. This integration has increased the effectiveness of the commander and reduced the role of uncertainty on the modern battlefield. The next logical step should be the integration of C2 systems personnel. Martin Van Crevald clearly expresses the significance of command and control to the battlefield commander in his book Command In War:

> The problem of commanding and controlling armed forces, and of instituting effective communications with and within them, is as old as war itself. A Stone Age chieftain had to devise the optimal organization and find the methods and technical means to command the forces at his disposal. From his day to ours, failure to consider and to solve the problem was to court disaster...indeed, to make it impossible for the forces to exist. (12:1)

The core of an effective C2 system is the ability to collect, process, display, store, and forward essential

information to the commander, in such a manner as to timely influence the battle.

C4I CONCEPT

Meaningful integration of C2 systems and personnel requires a basic understanding of the C4I concept and issues. General Gray, our former Commandant describing the essence of this concept in White Letter 01-91, charged commanders to "educate and train...instill the C4I concept into your Marines until it becomes the only way of thinking with regard to the effective integration of all command and control assets to support the commander." (2) The C4I concept is described in White Letter 01-91:

> Command and control are crucial to success, particularly in war...The command and control system is the commander's central nervous system...Command and control systems will always be considered as a totality including personnel, equipment, procedures, and information...Interoperability is the vital element that ties this concept together...We organize and fight as MAGTFs, independently, and in concert with joint and combined operations. All command and control systems must support our warfighting philosophy and warfighting needs. (2)

Effective integration will require the support and cooperation of all involved, or the efforts will fall short of the goal of supporting the operational commander. This requirement of effective C2 integration will be particularly evident as both resources and personnel are reduced in future military budgets.

TECHNOLOGY EXPLOSION

A dynamic C2 system must focus on the continuing need for the commander to be able to process the information received, make sound decisions, and transmit these decisions in a timely manner to those Marines who must act upon them. The size and nature of future battlefields will dictate the importance of timely and accurate information in support of C2. Integrated C2 systems and the technology they offer not only change the character of war: they also change the behavior of modern military organizations. Use of this technology enables commanders not only to gain advantage over the enemy and reduce uncertainty, but also to reshape the traditional processes on the battlefield by which they plan operations and manage forces in battle. Van Crevald comments: "uncertainty being the central fact that all command systems have to cope with, the role of uncertainty in determining the structure of command should be... and in most cases is...decisive." (12:268)

The command systems employed by the United States forces during Desert Shield/Storm reduced uncertainty, allowing the coalition forces to efficiently destroy a large Iraqi force in a time-compressed war. The technology used by United States forces at the start of the war was a major advantage, despite the apparent parity in force numbers, the Iraqi army's edge afforded by defending on its

homeland, and the long lines of communication. Effectively integrated C2 systems supported the timely phasing of all resources and personnel that were required. Computer networks over satellites, telephone circuits, and radio links were essential in tying together United States and coalition forces with critical data and information. Tactical and strategic systems gave instant warning of Iraqi missile launches, provided commanders with up-to-date logistics and force information, and permitted rapid planning of combat operations. (5)

C2 INTEGRATION

Within the Marine Corps, communications and data systems have evolved independently over the years. Each system performed its unique function and presented its own advantages and disadvantages to the commander. Until recently, these two components supported the commander as distinctly separate entities. The communication system "moved information" and the data system "processed information"; seldom did the two meet. (7) Recent events from Desert Shield/Storm have demonstrated that communication and computer equipment, properly connected, can produce a C2 system which is greater than the sum of the separate parts. The computer, when connected to the existing communication system, provides an important advantage to a combat force and its commander.

Timely and reliable information is the cornerstone to successful tactical operations. As noted in a recent after-action report from Operation Desert Storm:

> The use of computers in local and wide area networks eases the burden of AUTODIN while providing the Marine Expeditionary Force (MEF), Wing, Division, and Force Service Support Group (FSSG) staffs an accessible responsive means to distribute information on the battlefield. The use of personal computers to process information and as a terminal device for communication circuits has made the military teletype obsolete. During Desert Shield/Storm the Local Area Network (LAN)/Wide Area Network (WAN) configuration used by MARCENT performed many information system services. In the case of record traffic, the LAN/WAN provided a means for geographically dispersed units to send and receive AUTODIN messages via a communications center located miles away. Coupled with the use of the tactical telephone system providing a dial up service in either a point to point or into a LAN server, the use of computers for data transfer significantly enhances the speed, flexibility, and redundancy of the communication system. (10)

A serious issue facing the Marine Corps is the lack of specifically trained C2 systems personnel who are familiar with all aspects of command and control. The formation of the G-6 at the general staff level, as outlined in the C4I concept, has worked well to correct this deficiency. Additionally, the creation of the Information System Coordinator (ISC) within the S-6 establishment and alignment provides a single point of contact for communication and data issues. (9)

A reorganization which implements a new operating philosophy invites certain degrees of resentment within members of the military hierarchy. Personal opinion, military occupational skill (MOS) concerns, and equipment stovepipe issues have prevented a Marine Corps-wide C4I concept implementation. The core of this problem is twofold: the emerging requirement for complete C2 system integration and the necessity for consolidation of C2 systems planning personnel (MOSs 2502 and 4002) at the officer level.

Today, C2 systems integration crosses all functional areas. Tactical systems are required to interface with administrative systems daily. Garrison systems are taken to the field and interfaced directly with tactical systems. Almost no distinction exists between the two in this age of information transfer. While C2 systems integration is crucial to future success on the modern battlefield, integration and consolidation of C2 system planners (MOSs 2502 and 4002) is equally important to ensure that success.

A deficiency exists today concerning C2 systems integration, concepts, personnel requirements, and capabilities within the framework of the C4I concept. Consolidation of MOSs 2502 and 4002 would create a solid information systems awareness among C2 system users within the Marine Corps officer community, ultimately making the

job of those performing C2 systems planning less arduous. As the Marine Corps acquires more sophisticated C2 systems, it will become impossible to distinguish between data problems and communication problems. The Marine Corps will require officers skilled in both disciplines to effectively employ C2 systems. The outlined MOS consolidation as herein detailed will accomplish the goal of providing qualified C2 systems planners.

FUTURE MARINE C2

The requirement for data communications capabilities in the Marine Corps will expand dramatically in the future. A marked increase will occur in computer local area networks (LANs) and wide area networks (WANs) utilization. LANs and WANs have been used extensively, both in garrison and in the field, for several years. Their acceptance as a powerful information tool continues to escalate within Marine circles.

Computer networks support functional areas of Marine Corps operations from administration to logistics. Though many of these networks are tailored for garrison use, deployable mainframe computers now exist to increase the responsiveness of personnel, supply, and maintenance requirements. Local area networks are now commonplace in large field deployments. These LANs provide a variety of functions previously unavailable, such as electronic mail, file transfer, and real-time interactive keyboard exchange.

MTACCS

The future of Marine Corps data communications brings even greater challenges to the personnel tasked with designing, configuring, and maintaining the LANs and WANs, and the communication systems they ride. Automated command and control systems in the Marine Corps will fall under the umbrella of the Marine Tactical Command and Control System (MTACCS). MTACCS consists of several component systems to provide the MAGTF commander the ability to receive, process, and display tactical information for decision making. Specifically, MTACCS will assist the commander in planning, coordinating, and supervising the tactical employment of aviation, ground, and combat service support C2 assets. (6)

These systems will be connected via LANs and WANs riding the digital switched backbone system. System connectivity is planned throughout the MAGTF down to the battalion/squadron level. A description of planned tactical automated systems is required to demonstrate how far this technology will develop during the next three to five years. The following systems are currently at various stages of development within Marine Corps Systems Command.

Tactical Combat Operations (TCO) will be the commanders' work station within the Marine Tactical Command and Control System (MTACCS). TCO will allow commanders

to receive, fuse, display, and disseminate select information from other component systems of MTACCS. Additional TCO attributes include automated message management, mission planning, development and dissemination of operations orders and overlays, display of current friendly/enemy situations, display of fire support, and maneuver control measures. (11)

Advanced Field Artillery Tactical Data System (AFATDS) will be the fire support arm of MTACCS. AFATDS is designed to automate the command, control, and coordination between fire support elements and fire support coordination centers. Information such as target lists, fire missions, fire planning, and friendly locations will be passed over AFATDS terminals. (11)

Marine Combat Service Support Control System (MCSSCS) is the new name associated with the family of PC-based systems formerly called Marine Air Ground Task Force II/Logistics Automated Information System (MAGTF II/LOG AIS). MCSSCS is an integrated system that contains several logistics support applications pertaining to maintenance, logistics, supply, medical support, transportation, and personnel status issues. (3)

Intelligence Analysis System (IAS) is a computerized tool planned for use in intelligence sections. The system will automate the transfer and analysis of intelligence

information while increasing speed and improving accuracy. The IAS will provide access to intelligence databases, automated maps, on-line journals, and an imagery dissemination device. (11)

Advanced Tactical Air Command Central (ATACC) incorporates state-of-the-art technology to command and coordinate tactical air operations, conduct automated mission planning, and provide Air Tasking Order (ATO) generation and processing. (11)

MTACCS will give the Marine Corps a comprehensive command and control system. Figure 1 depicts future MAGTF C4I systems that the C2 systems planner will have to engineer and install in the future.

FUTURE MAGTF C2 SYSTEMS

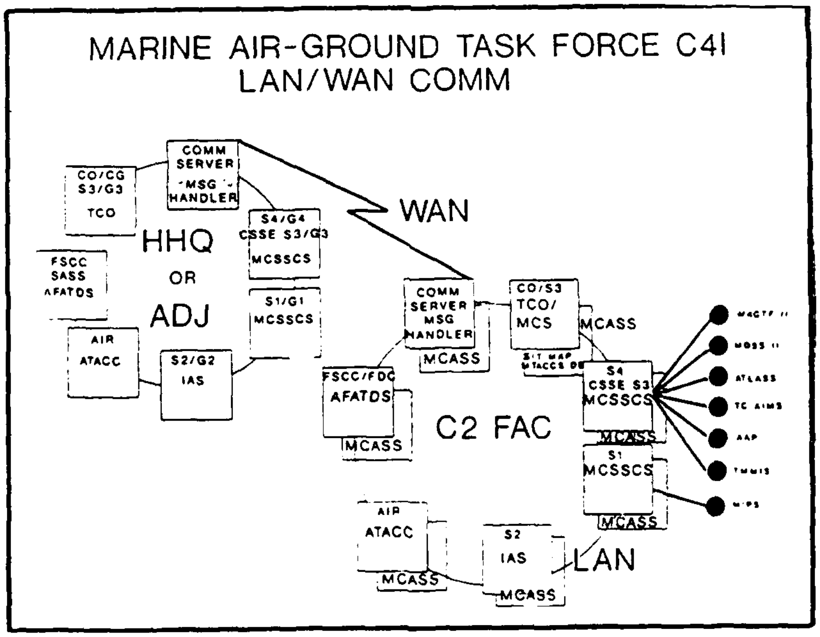


FIGURE 1

These systems will require skilled managers and technicians. Data communication system planning extending down to the battalion level will be a challenge for the most creative communicators. Configuring the servers to support the various systems will be even harder with the current cadre of data systems personnel. Increasing responsibilities will be placed on the unit information system coordinator (ISC).

SYSTEM INTEGRATION

System integration planners have placed great emphasis on the requirement for common computer hardware and software within MTACCS Systems. The use of common hardware and software will make component systems of MTACCS interoperable. The overlap between systems will reduce the amount of training required by MTACCS managers and users. The real challenge of MTACCS implementation will be to provide qualified personnel to configure terminals and LAN servers. In the design of MTACCS, several new types of equipment have been integrated into the data communications system: tactical network servers, packet radio switches, and tactical communication distribution nodes. Few Marines have the required knowledge to work with this new equipment.

Initial terminal configuration can be accomplished by trained data systems personnel. However, systems will fail and terminal configuration will have to be re-established. Unless the operator is trained, unacceptable down time could

be experienced while waiting for a data systems expert to remedy the problem. A similar situation will exist with LAN server configurations and the data communications system. While LAN administrators can be expected to configure servers within the system, trouble shooting will initially be the responsibility of the unit ISC due to the limited number of data systems personnel in the Marine Corps.

Program managers and systems-integration personnel have developed a comprehensive command and control family of systems. The fielding of these systems will significantly enhance the commander's ability to process information and make sound, timely decisions. The rapid rate in which the Marine Corps is introducing available information system technology is impressive. A high priority must be placed on training personnel to operate these new systems. Personnel must be trained, and in place, prior to system fielding. Identification of required skills is critical to this process. Successful fielding of MTACCS components and other data communication systems is dependent upon how successfully the Marine Corps educates the future information systems personnel who will fill the billets as unit ISCs.

PROPOSED SOLUTION

Forced reductions and budget cutbacks are facing all services; the Marine Corps is no exception. As the Marine

Corps cannot afford to train communications officers and data systems officers separately, efficiency dictates that they be combined into one Data Communications Officer MOS. Additionally, the recent implementation of Defense Management Review Decision (DMRD) 918 by the Defense Department has drastically changed the Marine Corps' data processing infrastructure.

Upon full implementation of DMRD 918, the Marine Corps will no longer require the 4002 MOS. All mainframe processing centers and design activities will be turned over to the Defense Information System Agency (DISA), which will be responsible for providing mainframe processing support to all the services. This process has already begun. Last year, the Marine Corps finance and records center at Kansas City was changed from a Marine Corps activity to a DISA activity. Other facilities such as the Central Design and Processing Activity (CDPA) at Quantico are scheduled for changeover to DISA in the near future. As this changes, the Marine Corps will effectively move out of mainframe processing, and the experience base required to manage these facilities will be drastically reduced. (4)

As the need for data processing officers is reduced, the need for officers skilled in tactical data communications will increase. The proposed MOS progression path begins with the lieutenant at the Basic Data

Communication Officer Course and lead to the captain at Command and Control Systems Course. Solving the problem of providing C2 system planners and creating a Data Communications Officer (DCO) can be accomplished in three phases.

PHASED APPROACH

The first phase will be an across the board redesignation of all 2502's and 4002's as Data Communication Officers, MOS 2502. This redesignation will occur from lieutenant to lieutenant colonel. Additionally, all table of organization (T/O) billets requiring either 2502 or 4002 will be changed to reflect the Data Communications Officer MOS 2502. Those billets that require specific mainframe computer skills after DMRD 918 implementation can be changed to either the Warrant Officer or Limited Duty Officer (LDO) 40XX MOS. In the words of Colonel D. P. Houston, "From this point on, Darwin's theory of evolution will occur. The officer who can [hack-it] will survive, while those who cannot will be [weeded-out]." (4) Officers within the Marine Corps have always taken pride in their ability to handle difficult and complex situations; successful completion of this billet assignment will be no different.

The second phase will combine the Basic Communication Officers Course (BCOC) with the Data Systems Officers Course (DSOC) within the Marine Corps University to create one

MOS-producing school for Data Communications Officers (DCO). Since DMRD 918 will eliminate the need to teach mainframe computing support skills to new officers, both Communication Officer School and Computer Science School must work together to create an officer capable of focusing on communications and tactical computer technology. The DCO will provide the Fleet Marine Force (FMF) and the supporting establishment an individual who is trained in communications and the tactical computer skills required to support MAGTF operations.

BCOC is now an eighteen week course, while DSOC is a fourteen week course. Both courses strive to instill in their students the basics of C2 systems; in many ways, their core curriculums complement each other. The object of combining the two schools is simple: to provide the Marine Corps with a single course of instruction which will prepare the DCO to survive the initial MOS assignment and successfully complete follow-on assignments.

The C2 systems information that they need will be the same regardless of assignment to the Fleet Marine Force or assigned to the supporting establishment. All required training must fit into a package of less than 20 weeks, thus reducing the Marines' time on temporary additional duty (TAD) and limiting the training, transient, patient, and prisoner (T2P2) cycle. (8) Appendix 1 represents a complete

illustration of the proposed 19 week/998 hour curriculum for the Basic Data Communications Officer Course (BDCOC). While this curriculum may require certain revisions, the major subcourses and hours are listed below:

SUBCOURSE	HOURS
- ADMINISTRATION	37.50
- COMMUNICATIONS SECURITY	16.50
- COMMAND POST OPERATIONS/DOCTRINE	39.50
- DATA	167.00
- EVALUATIONS	33.50
- EXPEDITIONARY OPERATIONS	31.50
- FIELD OPERATIONS	373.50
- LEADERSHIP	31.00
- MAINTENANCE	37.50
- SWITCHED BACKBONE SYSTEMS	108.50
- SINGLE CHANNEL RADIO	72.50
- THEORY	49.50
TOTAL HOURS	998.00

This proposal builds upon the basic curriculum used by BCOC and provides the DCO with essential information systems and data skills. Utilizing Individual Training Standards (ITS), the intent of this curriculum is to teach the DCO the skills necessary for effective job performance.

The third phase will require that the Marine Corps train the current company grade 4002 population to transition from a computer-only focus to a broader information systems focus. This could be accomplished by providing the FMF and supporting establishment additional quotas for 4002 officers to attend either Basic Data Communications Officer Course or Command and Control Systems Course at Communication Officers School. Upon completion, 4002 officers would be reassigned the primary MOS of 2502

and placed in Data Communication Officer billets.

Upon graduation, the DCOs will report for their first MOS assignment. Since all 2502 and 4002 MOS T/O line numbers are now MOS 2502, the amount of C2 systems information required for each assignment will vary. Whatever the assignment, the DCO will be expected to remain current with changing technology through on-the-job training, professional military education, and professional publications and seminars. In this way, the officer serving with the FMF and dealing with SINCGAR radios and communication operating instructions on a daily basis should be as knowledgeable about evolving computer hardware and software as his counterpart serving the supporting establishment at Headquarters Marine Corps.

ADVANTAGES & DISADVANTAGES

This integration proposal offers several advantages and disadvantages. Advantages begin with the money saved by the combination of facilities and consolidation of instruction into one MOS-producing school within the Marine Corps University. Additionally, production of a DCO reduces the need for specific follow-on communications and data systems training as the two technologies continue to expand. The Data Systems School will not, however, disappear. This school is required for entry level data systems instruction of enlisted personnel. It provides BANYAN VINES training

and certification within the Marine Corps; if required, it can provide unique data systems instruction to BDCOC graduates and other officers. The DCO additionally provides the commander with an individual who is the single point of contact concerning all C2 issues and can quickly provide the necessary C2 systems planning and engineering.

Critics of this proposal cite the disadvantage to this merger is the inability of the individual to retain C2 systems knowledge necessary for initial and subsequent duty assignments. (8) Current Marine Corps manpower policies regarding progression paths within communications and data systems MOSs also hinder, rather than help, the effort to provide officers capable of performing C2 systems planning. Officers in these progression paths are routinely interchanged between MOS-related assignments, both within the FMF and the supporting establishment and outside a specific MOS, such as recruiting or drill field duty. (8) The goal of this policy, to produce a balanced, well-rounded officer, may be achieved. However, this policy produces a rapid decline in technical MOS skills for significant periods of time. Given the rapid pace of technology development today, this policy is neither cost nor time effective.

Teamwork and cooperation is essential if the Marine Corps plans to provide effective C2 system planning.

Adjustments must include provisions which allow designated DCOs and C2 officers to remain in assignments or billets that positively affect increased MAGTF C2 systems planning and operations. This approach will serve to stabilize the C2 systems operation within the Marine Corps, prevent declining technical skills, and allow Marine Corps C2 systems planners and DCOs to keep pace with current state-of-the-art technology.

C4I SYSTEMS PLANNER ADDITIONAL MOS

As the DCOs progress through their careers, they will be forced to contend with rapidly expanding technology and the introduction of newly-fielded C2 systems. The DCOs receive their first real introduction into joint and combined C2 systems planning at the Command and Control Systems Course (CCSC) at Communications Officer School. Certain T/O billets within the communications and data systems fields require C2 specialists to conduct C2 systems planning. Until recently, neither these billets nor the officers possessing C2 systems planning experience were flagged in any manner by the Marine Corps manpower system. Therefore, no mechanism existed to ensure that officers capable of performing C2 systems planning were properly placed by the manpower system in billets requiring such skill.

Headquarters Marine Corps (HQMC), in its recent publication ALMAR 050/93, acknowledged the importance of maintaining a cadre of qualified C2 systems planners and the necessity of matching certain abilities to specific billets. This ALMAR outlines Marine Corps plans for the establishment of a C4I planner additional MOS. Whether the additional MOS is C4I planner or C2 systems planner, the intent of identifying specific officers for specific billets remains the same. The ALMAR which establishes this concept for the additional MOS is outlined as follows:

> The intent is to identify officers who have special education in C4I systems architecture... This additional MOS will be given to all Marine Corps officers, Captain to Lieutenant Colonel, who have graduated from CCSC since academic year 1992...Billets located within operating forces and supporting established units are being staffed for T/O modification and billet designator flagging...C4I planners will provide the unit commander with a knowledgeable staff planner in all areas of C4I systems...this assignment will additionally enhance speed and accuracy of C4I planning and improve unit capability to operate in the joint and combined environment. (1)

Success in future operations greatly depends upon how the Marine Corps manages the future of command and control. The focus of C2 can no longer be on any single piece of equipment. The DCO must focus on the entire C2 system and consider how this system interfaces with various joint and combined service agencies. The integration of C2 personnel, MOSs 2502 and 4002, coupled with the valid requirement of

providing specific C4I planners, works well to fully implement the C4I concept outlined by General Gray in 1991.

CONCLUSION

The C2 systems personnel required to meet the rapidly expanding technology of future operations can be achieved by integrating MOSs 2502 and 4002 at the officer level into one Data Communications Officer MOS. Additionally, designating graduates of the Command and Control Systems Course as C4I systems planners provides the Marine Corps with a nucleus of specifically trained command and control professionals. Through improved education, cooperation, integration of personnel, relaxation of certain MOS progression impediments, and logical billet utilization, the Marine Corps could greatly improve C2 systems planning and effectiveness. The Marine Corps can thus be assured that the C2 needs of commanders in future operations will be successfully met by a highly trained and skilled cadre of C2 systems planning professionals.

BASIC DATA COMMUNICATIONS OFFICER COURSE

SUBCOURSE - ADMINISTRATION

DESCRIPTION	HOURS
DCO SECURITY BRIEF	0.50
ADMIN/MEDICAL CHECK-IN	1.50
PUBS ISSUE	1.00
CLASS PHOTO	1.00
READING TEST	2.00
INVENTORY PFT	2.00
782 GEAR ISSUE	1.50
VEHICLE SAFETY BRIEF	0.50
782/PUBS TURN-IN	2.00
FINAL PFT	2.00
ADMIN PROCESSING	3.50
INITIAL COUNSELING	4.00
MIDTERM COUNSELING	4.00
FINAL COUNSELING	4.00
SECURITY DEBRIEF	0.50
GRADUATION REHEARSAL	1.00
GRADUATION PREP TIME	0.50
GRADUATION	1.00
GRADUATION RECEPTION	1.50
FINAL ADMIN CHECK-OUT	3.50
	37.50

SUBCOURSE - COMMUNICATIONS SECURITY

DESCRIPTION	HOURS
INTRO TO CMS SYSTEM	1.50
INTRO TO COMSEC EQUIPMENT	2.00
INTRO TO COMSEC	4.00
INTRO TO C2W	1.00
INTRO TO EW	1.00
USMC C2W	1.00
ECCM	1.00
INTRO TO USMC CMS	0.50
CMS MATERIAL ID	0.50
CMS ACCOUNTABILITY	1.00
PHYSICAL SECURITY	0.50
INSPECTION & AUDITS	1.00
EMERGENCY ACTION PLANS	0.50
CMS OVERVIEW	1.00
	16.50

SUBCOURSE - COMMAND POST OPERATIONS/DOCTRINE

DESCRIPTION	HOURS
COMM IN INF BN	1.50
RADIO CTR/COC	1.00
SYSTEM TROUBLESHOOTIUNG	1.00
CP SYSTEMS DEMO	2.50
EQUIPMENT PROTECTION	1.50
CP REQUIREMENTS/DISPLACEMENT	2.00
CP RECON/SELECTION	1.00
VISUAL & SOUND COMM	0.50
GCE LAYDOWN	1.50
COMM PLANS & ORDERS	1.50
COMM-ELEC ESTIMATE	1.00
COMM PLANNING	1.50
COMM FOR BN FSCC	1.50
COMM IN ARTY BN	2.00
INTRO TO MARINE AIR	1.00
INTRO TO DASC	1.00
INTRO TO TACC	1.00
INTRO TO MWCS	1.00
COMM IN MOUNT ENVIRONMENT	1.50
MSG FORMATS TRAFFIC	1.00
STATION COMM CRT OPS	2.00
CAST ENGINEERING	3.00
CAST TRAINER	8.00
	39.50

SUBCOURSE - DATA

DESCRIPTION	HOURS
INTRO TO DIGITAL COMMUNICATIONS	3.00
TERMINAL DEVICES	4.00
TERMINAL DEVICES PA	2.00
INTRO TO SPEED	1.00
SPEED PA #1	2.00
SPEED PA #2	2.00
DATA FOR ANNEX K	2.00
INTRO TO MICROCOMPUTERS	8.00
INTRO TO MICRO O/S	12.00
INTRO TO DOS	2.00
MICROCOMPUTER SECURITY	2.00
ENABLE OA	8.00
HARVARD GRAPHICS	4.00
CD ROM	2.00
MICROCOMPUTER TROUBLESHOOTING	12.00
MICROCOMPUTER TROUBLESHOOTING PA	4.00
INTRO TO LAN	2.00
LAN MANAGEMENT	3.00
LAN OPERATIONS	12.00

APPENDIX 1

LAN PA	4.00
INTRO TO WAN	2.00
WAN OPERATIONS	12.00
WAN PA	4.00
MODEMS	2.00
LANEX	16.00
INTRO TO UNIX	1.00
UNIX	4.00
INTRO TO MAINFRAMES	2.00
INTRO TO PERIPHERALS	1.00
CAPACITY PLANNING	1.00
INFORMATION MANAGEMENT	1.00
MAINFRAME PA	3.00
NETWORKS AND MCDN	2.00
TERMINAL EQUIPMENT	2.00
HARDWARE LAB	4.00
INTRO TO ADA	1.00
ADA PRINCIPALS	8.00
PROJECT MANAGEMENT	4.00
ADVANCED DATA APPLICATIONS	4.00
FMF DATA APPLICATIONS	2.00
	167.00

SUBCOURSE - EVALUATIONS

DESCRIPTION	HOURS
ELEC/RADIO QUIZ	1.00
ELEC/RADIO QUIZ REVIEW	1.00
DATA COMM QUIZ	1.00
EXAM #1	1.50
EXAM #1 CRITIQUE	0.50
EXAM #2	1.50
EXAM #2 CRITIQUE	0.50
MIMMS QUIZ	1.50
MIMMS (MCI) EXAM	2.00
EXAM #3	1.50
EXAM #3 CRITIQUE	0.50
EXAM #4	1.50
EXAM #4 CRITIQUE	0.50
ISSUE ANNEX K (HW)	0.50
ANNEX K (HW)	10.00
C7 DIAGRAM	1.00
DATA EXAM #1	2.00
DATA EXAM #1 CRITIQUE	0.50
DATA EXAM #2	2.00
DATA EXAM #2 CRITIQUE	0.50
EXAM #5	2.00
EXAM #5 CRITIQUE	0.50
	33.50

APPENDIX 1

SUBCOURSE - EXPEDITIONARY OPERATIONS

DESCRIPTION	HOURS
COMM GUARD SHIFT	1.00
COMM GUARD PA	1.00
DCS COMMON USER SYSTEM	2.00
INTRO TO EXPEDITIONARY OPS	2.00
USN COMMUNICATIONS	1.50
AMPHIB CONTROL AGENCIES	2.00
SATELLITE OPS	2.50
MEU (SOC)	1.50
AMPHIB COMM PLANNING	2.50
AMPHIB COMM PLANNING PA	1.00
INTRO TO SRIG	2.00
INTRO TO MPF OPS	2.00
SPACE SYSTEMS	1.00
MILITARY SATELLITE COMM	1.00
UHF TERMINAL EQUIPMENT	1.50
SATCOM PA	3.50
MAGTF COMM ARCHITECTURE	2.00
MAGTF COMM LAYDOWN	1.50
	31.50

SUBCOURSE - FIELD OPERATIONS

DESCRIPTION	HOURS
PHASE I: BILLETS	1.00
PHASE I: OP CHECK	2.00
PHASE I: PLANNING	2.00
PHASE I: BRIEFINGS	1.00
PHASE I: FIELD EXERCISE	45.00
PHASE I: EQUIPMENT PM	5.00
PHASE I: CRITIQUE	1.00
SINCGARS OP BRIEF	0.50
SINCGARS STUDENT PLANNING	1.50
SINCGARS OP, STAGE, BRIEF	1.50
SINCGARS FINAL EXERCISE	4.50
SINCGARS PM & DEBRIEF	1.00
INTRO TO PHASE 11	0.50
PHASE II: OPS BRIEF	2.00
PHASE II: BILLETS	0.50
PHASE II: PLANNING	8.00
PHASE II: OP CHECKS	4.50
PHASE II: REHEARSAL	5.00
PHASE II: MASS BRIEF	1.00
PHASE II: FIELD EXERCISE	68.00
PHASE II: CRITIQUE	1.50
PHASE II: EQUIPMENT PM	7.00
INTRO TO PHASE III	0.50
PHASE III: PLANNING	8.50

APPENDIX 1

PHASE III: OPS BRIEF	2.00
PHASE III: BILLETS	1.00
PHASE III: OP CHECK & LOAD	3.50
PHASE III: REHEARSAL	3.50
PHASE III: MASS BRIEF	1.00
PHASE III: FIELD EXERCISE	68.00
PHASE III: CRITIQUE	1.00
PHASE III: EQUIPMENT PM	5.50
INTRO TO 8400	0.50
8400 STUDENT PLANNING	12.00
8400 BILLETS	0.50
8400 REHEARSAL	4.50
8400 MASS BRIEF	1.50
BLT CPX/8400	56.50
8400 CRITIQUE	2.00
8400 EQUIPMENT PM	5.00
DIVISION ORGANIZATION	5.00
FSSG ORGANIZATION	2.00
PLRS & GPS TRAINER	4.00
MEPG DISPLAY OF EQUIPMENT	4.00
MWCS ORGANIZATION	3.50
TOUR NAB/AMPHIB	4.00
	373.50

SUBCOURSE - LEADERSHIP

DESCRIPTION	HOURS
DIRECTORS REMARKS	0.50
INTRODUCTIONS	0.50
DCO BRIEF	0.50
VIEW OF INF BN CMDR	1.50
COMM IN EXTREME ENVIRONMENTS	1.50
COMMAND IN WAR	2.00
LEADERSHIP I: BATTLE STUDY	1.50
CHANCELLORSVILLE BATTLE STUDY	4.00
MILITARY BRIEFINGS	1.50
LEADERSHIP SYMPOSIUM	2.00
LEADERSHIP RECEPTION	1.50
LEADERSHIP DISCUSSION PANEL	2.00
LEADERSHIP II: SENIOR/SUBORDINATE	1.00
PROMOTIONS BOARDS	1.50
TRAINING THE DATA COMM PLATOON	2.00
TQL	1.50
FACAD TIME	5.00
DIRECTOR'S CLOSING REMARKS	1.00
	31.00

APPENDIX 1

SUBCOURSE - MAINTENANCE

DESCRIPTION	HOURS
MIMMS (MCI)	20.00
MIMMS PART I	1.00
MAINTENANCE MANAGEMENT FOR CMDRS	15.00
MIMMS FOR DATA COMM PLATOON	1.50
	37.50

SUBCOURSE - SWITCHED BACKBONE SYSTEMS

DESCRIPTION	HOURS
ANALOG TELEPHONES	1.00
FIELD WIRE INSTALLATION	2.50
SB-22 SWITCHBOARD	2.50
SB-3614 SWITCHBOARD	3.00
MDF EQUIPMENT	1.00
MDF INSTALLATION & OPERATION	3.00
NETWORK PLANNING & DOCUMENTATION I	1.00
SWITCHBOARD PA	3.50
RADIO-WIRE INTERFACE	1.50
ULCS	40.00
SBB SYSTEMS	0.50
JOINT TAC COMMUNICATION SYSTEM	0.50
DIGITAL TELEPHONES	2.00
SECURE NET RADIO INT	2.00
SB-3865 ULCS	3.00
SBB/TERM DEVICE PA #1	3.50
TRUNK ENCY DEV/KG-94A	1.00
NETWORK ENCRYPTION	1.50
NETWORK PLANNING & DOCUMENTATION II	3.00
MULTIPLEX CONCEPTS	1.50
RMC, TD-1324	2.00
SBB/RMC PA #2	3.00
LOS TX, MRC-135B	1.50
LOS TX, MRC-142	2.00
NETWORK TIMING	1.00
SBB/MRC-142 PA #3	4.00
NETWORK PLANNING III	3.50
SBB/SYSTEMS PA #4	6.00
SBB/SYSTEMS PA #5	8.00
	108.50

SUBCOURSE - SINGLE CHANNEL RADIO

DESCRIPTION	HOURS
LOS PROPAGATION PLAN	1.50
INTRO TO SCR	0.50
PORTABLE VHF SCR	1.00

APPENDIX 1

RTO PROCEDURES	1.50
FIELD MESSAGE DRAFTING	0.50
Q AND Z SIGNALS	1.00
SCR ANTENNAS	1.00
BATTERY MANAGEMENT & PLANNING	2.00
RADIO REMOTES	1.50
PORTABLE VHF PA	2.50
VEHICLE VHF RADIOS	1.50
VHF RETRANSMISSION	1.50
SCR/RTX PA	3.00
HF SCR	2.00
ANTENNA DESIGN I	1.50
ANTENNA PA #1	2.00
HF PREDICTION SYSTEM	0.50
HF PREDICTION SYSTEM PA	1.00
ACEOI/RADIO GUARD CHART	3.50
ACEOI/GUARD CHART PA	1.00
INTRO TO ECAC	1.50
TACTICAL FREQUENCY MANAGEMENT	1.00
HF NET ENGINEERING	1.00
HF NET ENGINEERING PA	1.00
OTAR/SARK OPS	2.00
OTAR/SARK PA	0.50
ANTENNA DESIGN II	4.00
INTRO TO SINCGARS	0.50
INTRO TO SINCGARS ICOM	2.00
SINCGARS THEORY	0.50
SC SINCGARS COVERED	1.00
FH DATA/CYZ-10 LOAD	2.50
NON-FH/COMSEC PA	2.00
SINCGARS FH OPENING	2.00
MAINTAINING FH NETS	2.00
SINCGARS FH PA	3.00
SINCGARS RETRANSMISSION	1.00
SINCGARS ANCILLARY/REMOTE	1.00
SINCGARS NECOS OPS	4.00
SINCGARS NECOS PA	2.50
UHF SCR PORTABLE & VEHICLE	2.00
MECHANIZED VEHICLE RADIOS	1.50
LAV-C2, BV, C7 DEMO	3.50
	72.50

SUBCOURSE - THEORY

DESCRIPTION	HOURS
INTRO TO ELECTRICITY	2.00
INTRO TO COMMUNICATIONS	1.00
BASIC ELECTRICITY I	2.00
BASIC ELECTRICITY II	2.00
ELECTROMAGNETIC SPECTRUM	1.00
BASIC ELECTRICITY III	2.00

APPENDIX 1

ANALOG TELEPHONE	1.00
SWITCHING CONCEPTS	2.00
BASIC ELECTRICITY IV	2.00
INTRO TO ANTENNA THEORY	1.00
TX LINE THEORY	1.50
GROUNDING THEORY	1.00
AM/FM RADIO THEORY	3.00
GROUND INSTALLATION PROCEDURES	1.00
TYPES OF GROUNDS	1.00
HAZARD MATERIAL/HAZARD WASTE	1.50
MEPG POWER EQUIPMENT	1.00
MEPG THEORY	0.50
ANTENNA FUNDAMENTALS	4.00
MEPG LOAD PLANNING	2.00
HF COMM PRINCIPLES	3.00
GROUNDING PA	1.00
MEPG SELF PACED TEXT	6.00
MEPG PLANNING CONSIDERATIONS	1.00
MEPG SYSTEM DESIGN	2.00
MEPG SAFETY & MAINTENANCE	0.50
DIGITAL TELEPHONE	1.50
DIGITAL SWITCHING CONCEPTS	2.00
	49.50
TOTAL HOURS	998.00

APPENDIX 1

BIBLIOGRAPHY

1. Commandant of the Marine Corps ALMAR 050/93. "Establishment of C4I Planner Additional MOS (AMOS)." HQMC: Washington, DC., 28 Jan 1993.

2. Commandant of the Marine Corps White Letter 01-91. "C4I2 Concept." HQMC: Washington, DC., 26 Jun 1991.

3. Espinoza, A. J. Major, USMC. C2 Acquisitions, Marine Corps Systems Command. Personal Interview, MCCDC. Dec 1992.

4. Houston, D. P. Colonel, USMC. Director, MCDPA. Personal Interview, MCCDC. Dec 1992.

5. Macedonia, M. R. Major, USA. "Information Technology in Desert Storm." Military Review, Oct, 1992:36.

6. Noel, M. D. Captain, USMC. C2 Acquisitions, Marine Corps Systems Command. Personal Interview, MCCDC. Feb 1993.

7. Simpson, R. D. Major, USMC. "Communication and Computer Systems; A Natural Connection." Unpublished Student Paper, Marine Corps Command and Staff College, Quantico, VA., 1992.

8. Shea, R. M. Colonel, USMC. Director, Communication Officers School. Personal Interview, MCCDC. Dec 1992.

9. Smith, R. N. Colonel, USMC. Branch Head CCT, HQMC. Personal Interview, MCCDC. Dec 1992.

10. United States Marine Corps. Marine Corps Lesson Learned System, Number 42320-31260. "Local and Wide Area Networks." After action item, submitted by Captain Learn, I MEF, Operation Desert Storm.

11. United States Marine Corps. Marine Tactical Command and Control System (MTACCS) Operational Concept, 26 Dec 1990.

12. Van Crevald, Martin L. Command In War. Cambridge, Massachusetts: Harvard University Press, 1985.